Armed Forces College of Medicine

AFCM

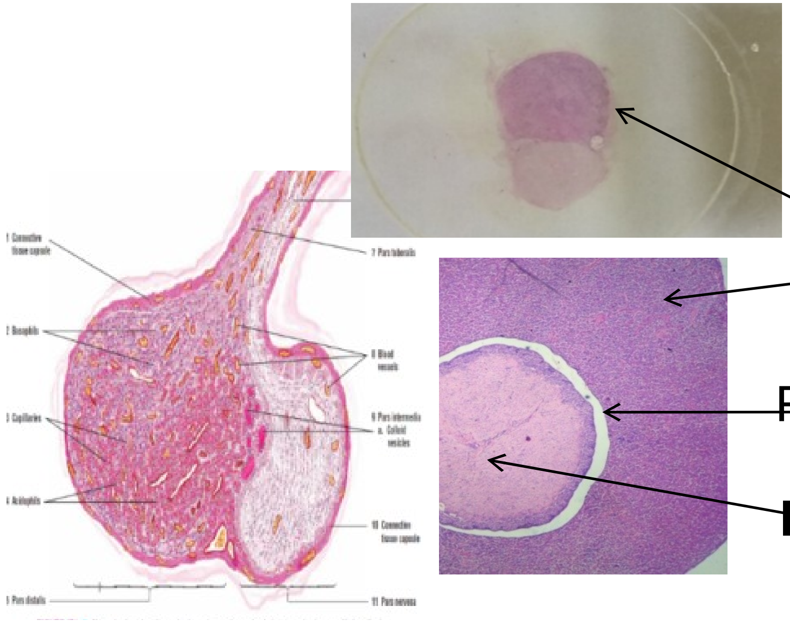
Practical Endocrine system

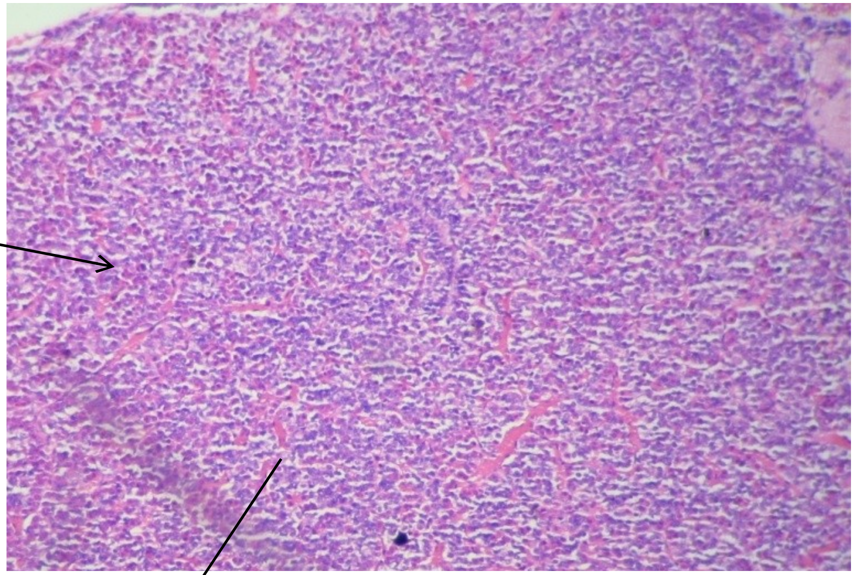
Prof. Dr. Manal Hassan Moussa

INTENDED LEARNING OBJECTIVES (ILO)

- Identify H&E sections in Pituitary gland
- Identify H&E sections in Thyroid and parathyroid glands
- Identify H&E sections in Suprarenal gland
- Identify H&E sections in Pancreas
- Identify TEM of steroid hormone secreting cell
- Label TEM of steroid hormone secreting cell

Pituitary Gland

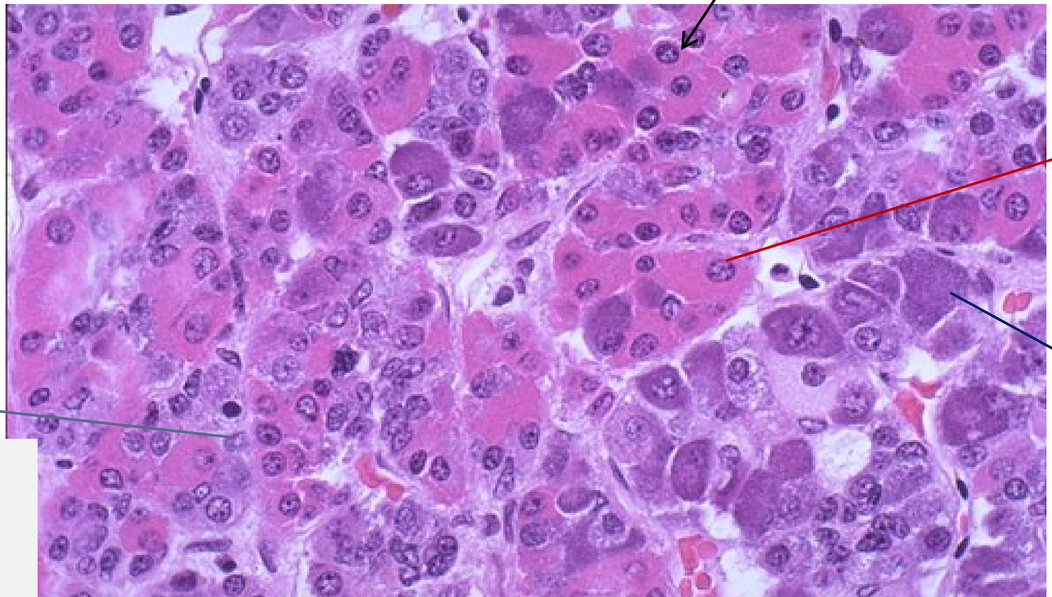




Pars distalis

Rathke’s pouch

Pars nervosa

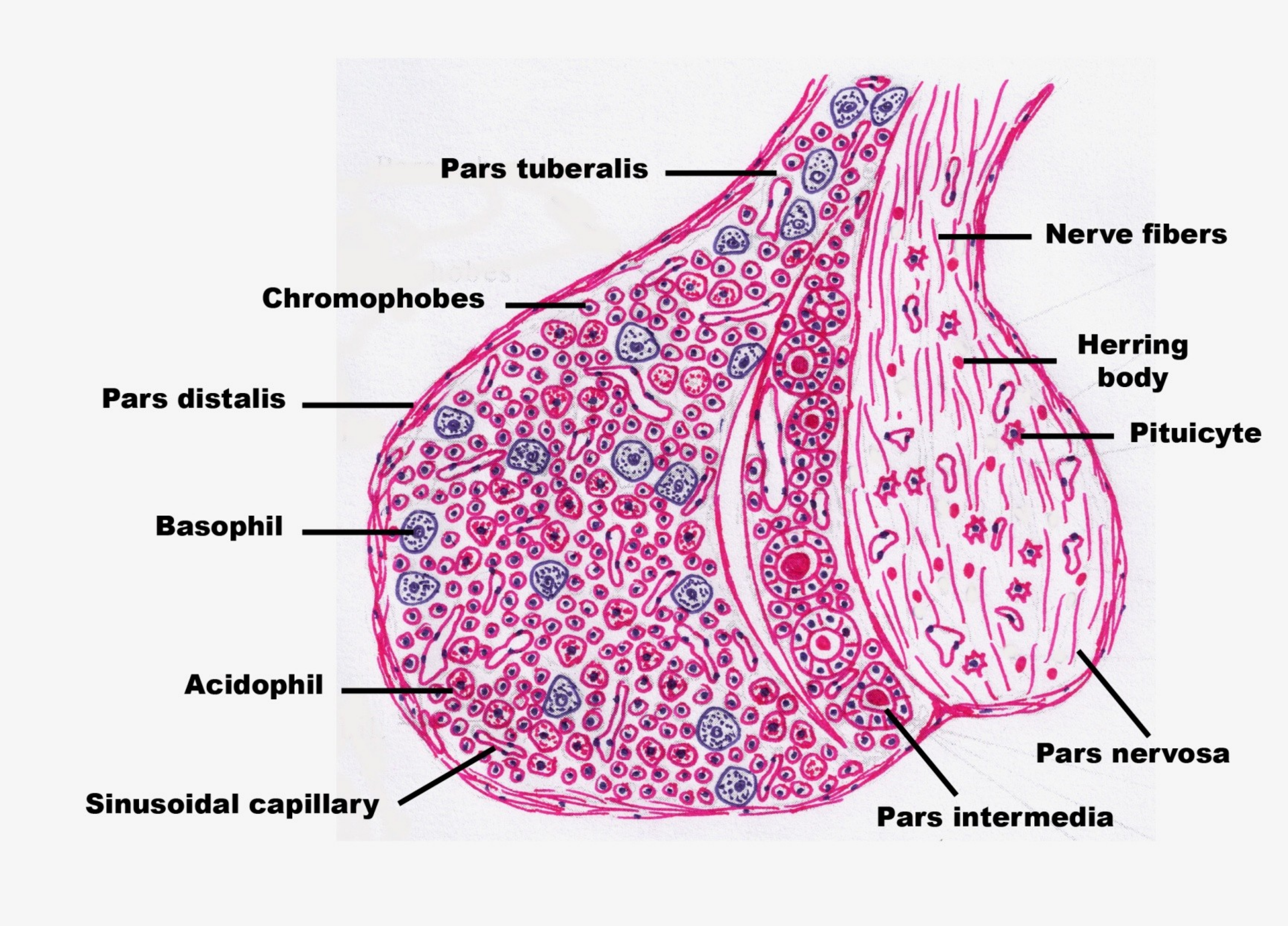


Acidophils

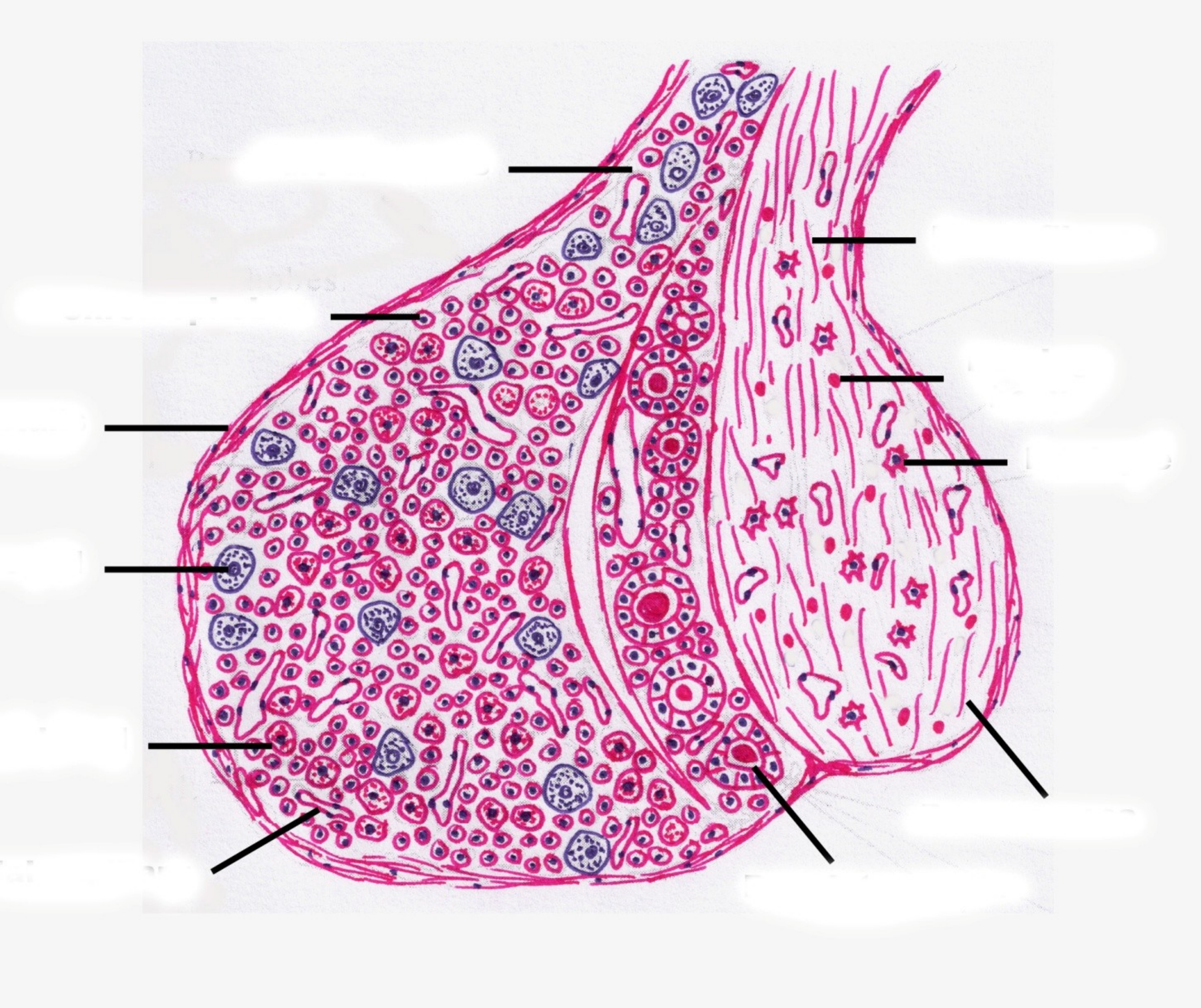
Basophils

Chromopho
bes

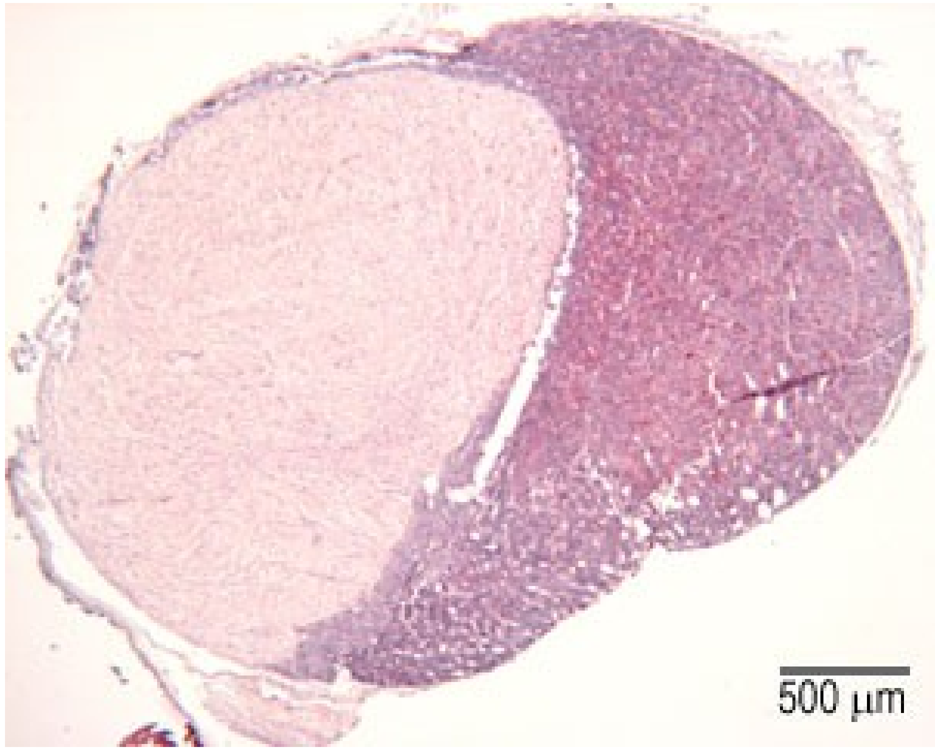
Pituitary Gland

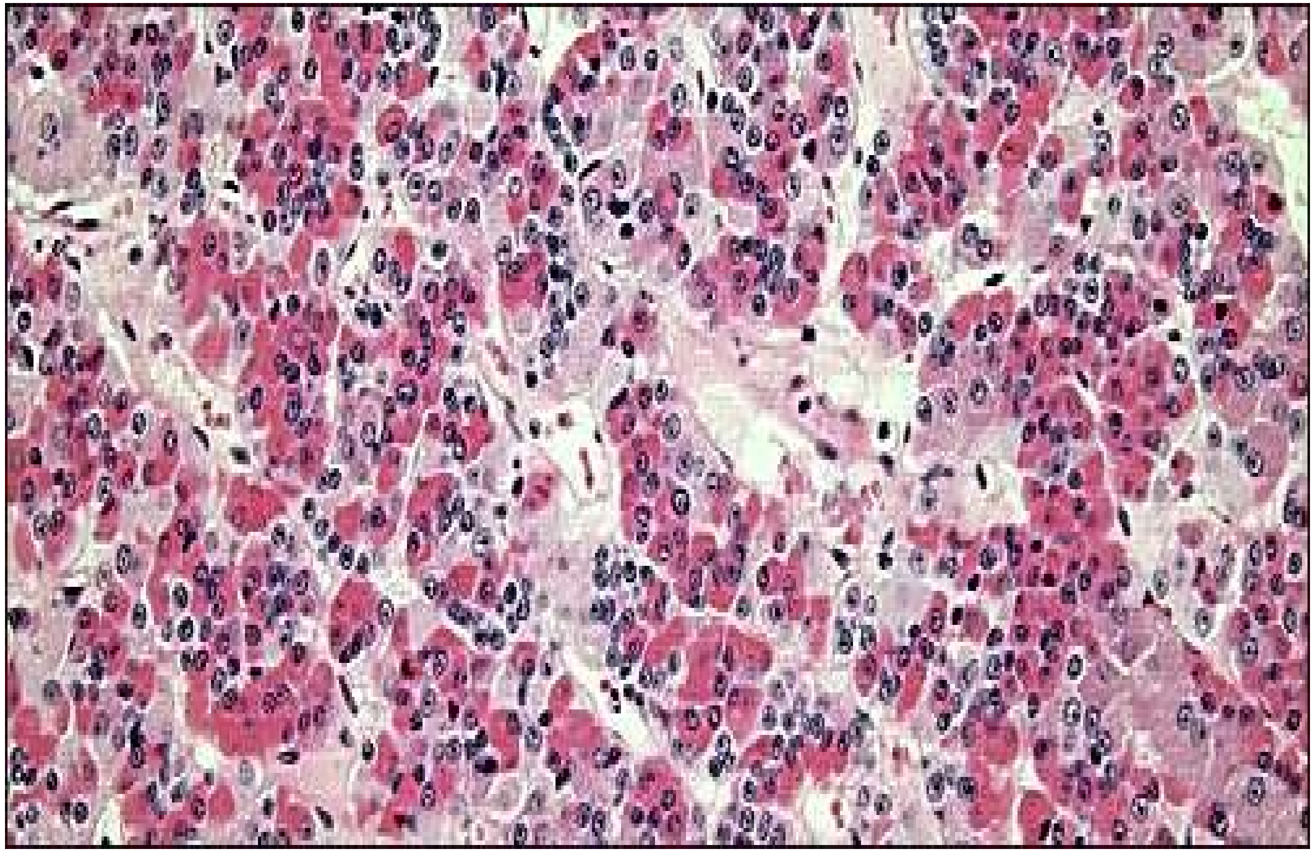


Pituitary Gland



Pituitary Gland





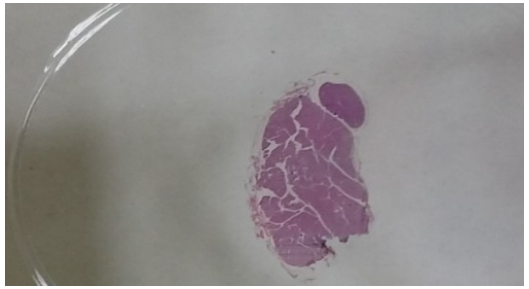
https://www.histology.leeds.ac.uk/glandular/pituitary.php

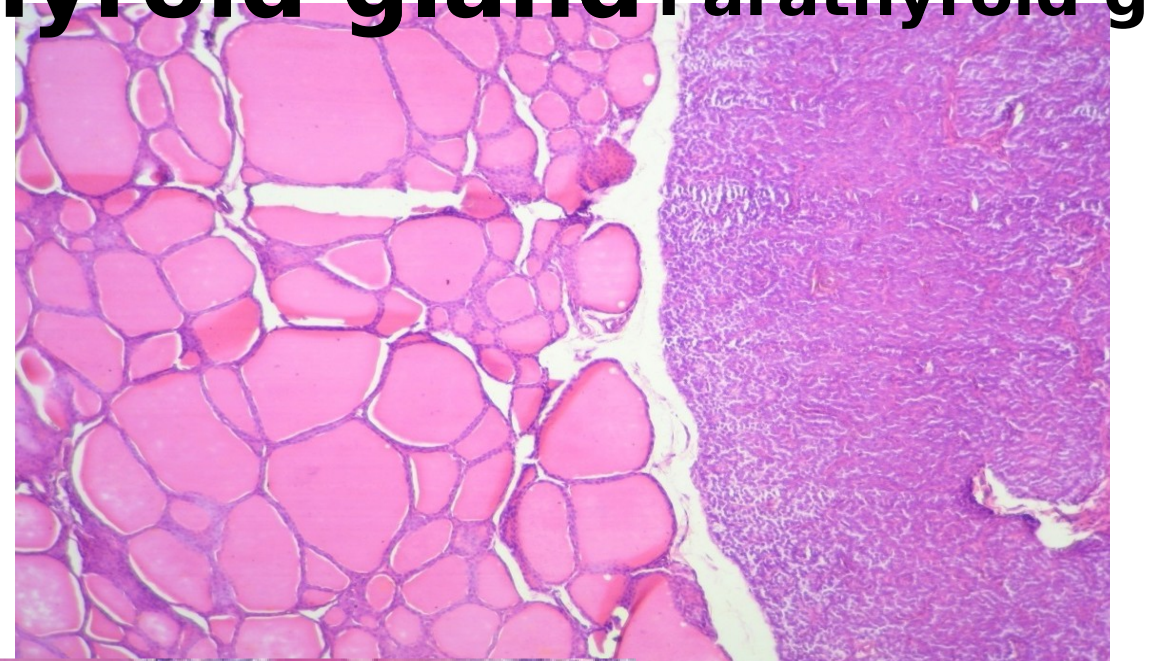
http://www.vivo.colostate.edu/hbooks/pathphys/endocrine/hypopit/histo_adeno.html

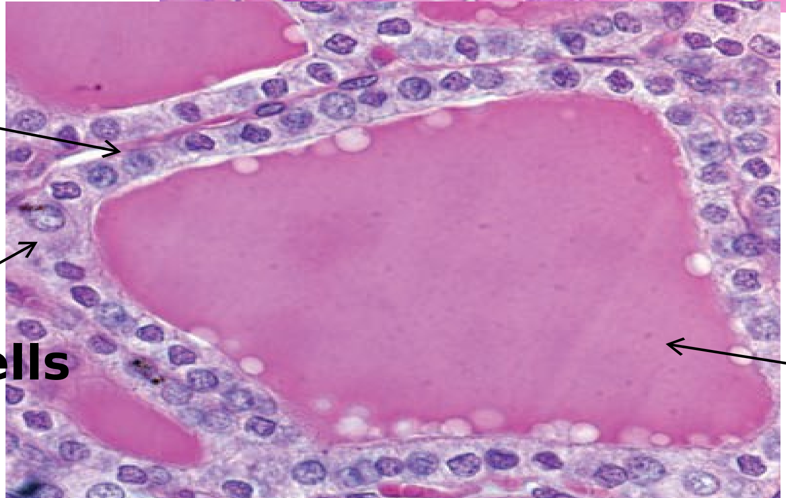
Thyroid and Parathyroid Glands

Thyroid gland

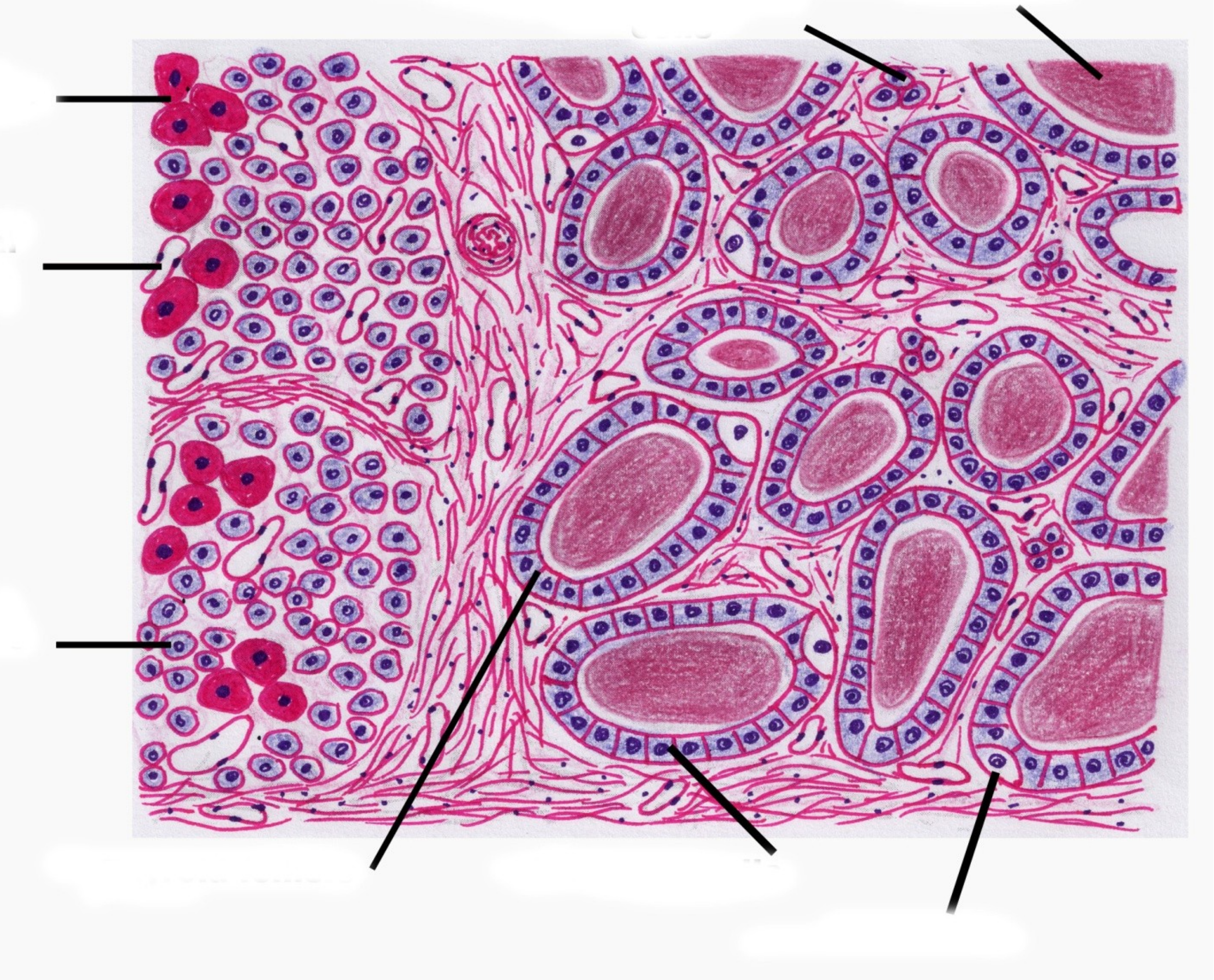
Parathyroid gland



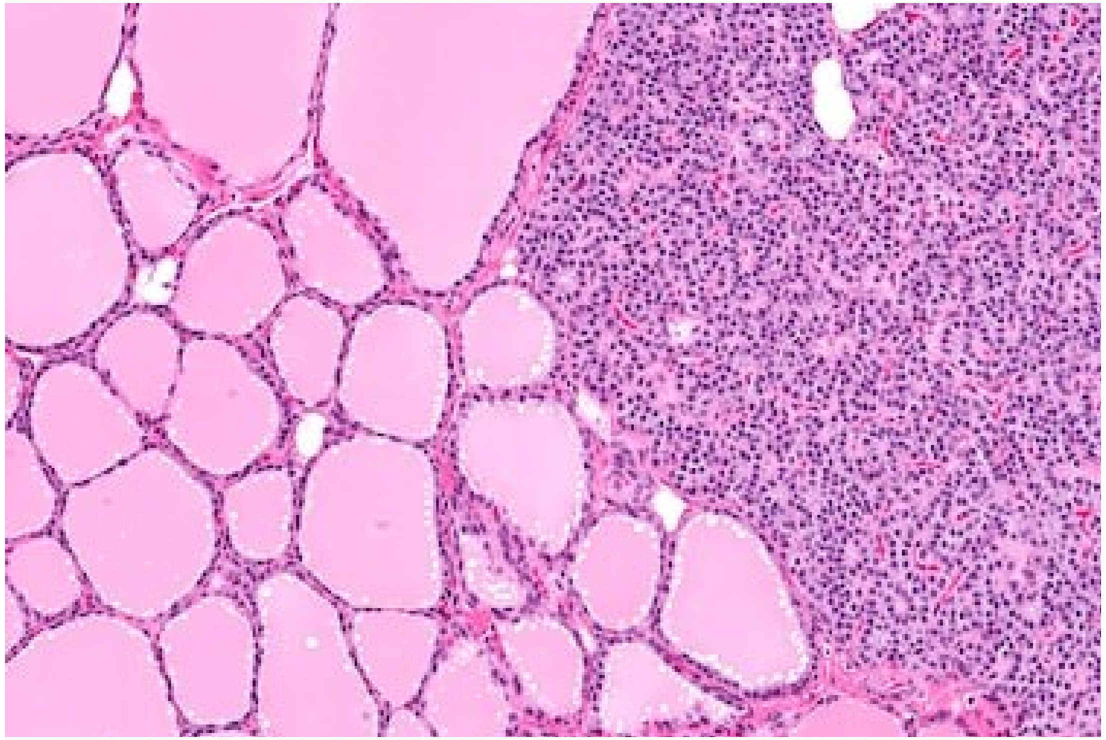




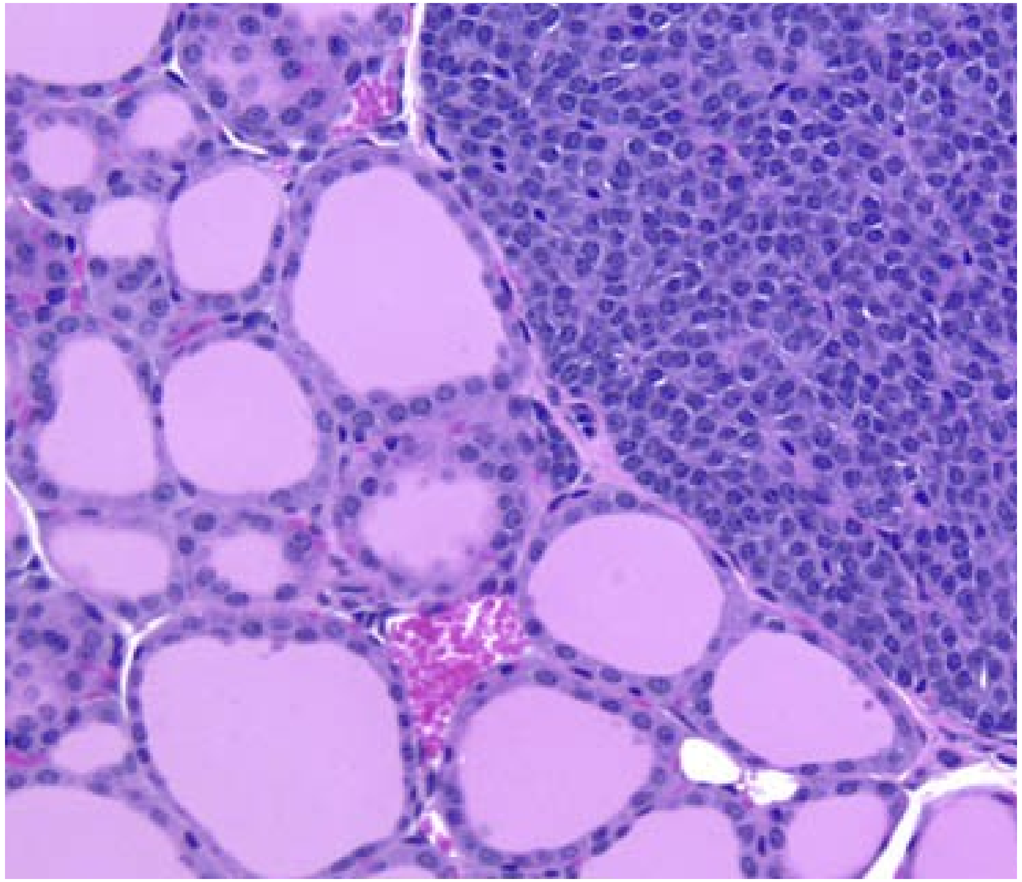
Thyroid and Parathyroid Glands



Thyroid and Parathyroid Glands

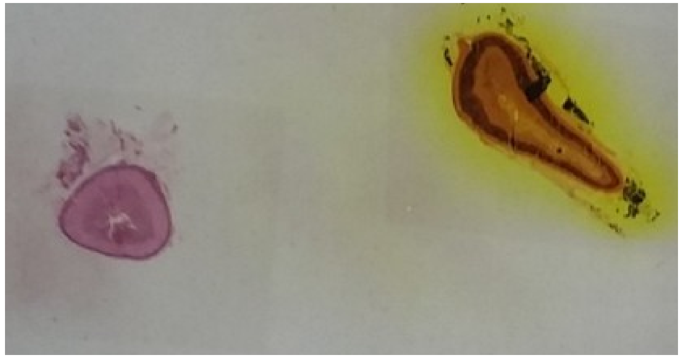


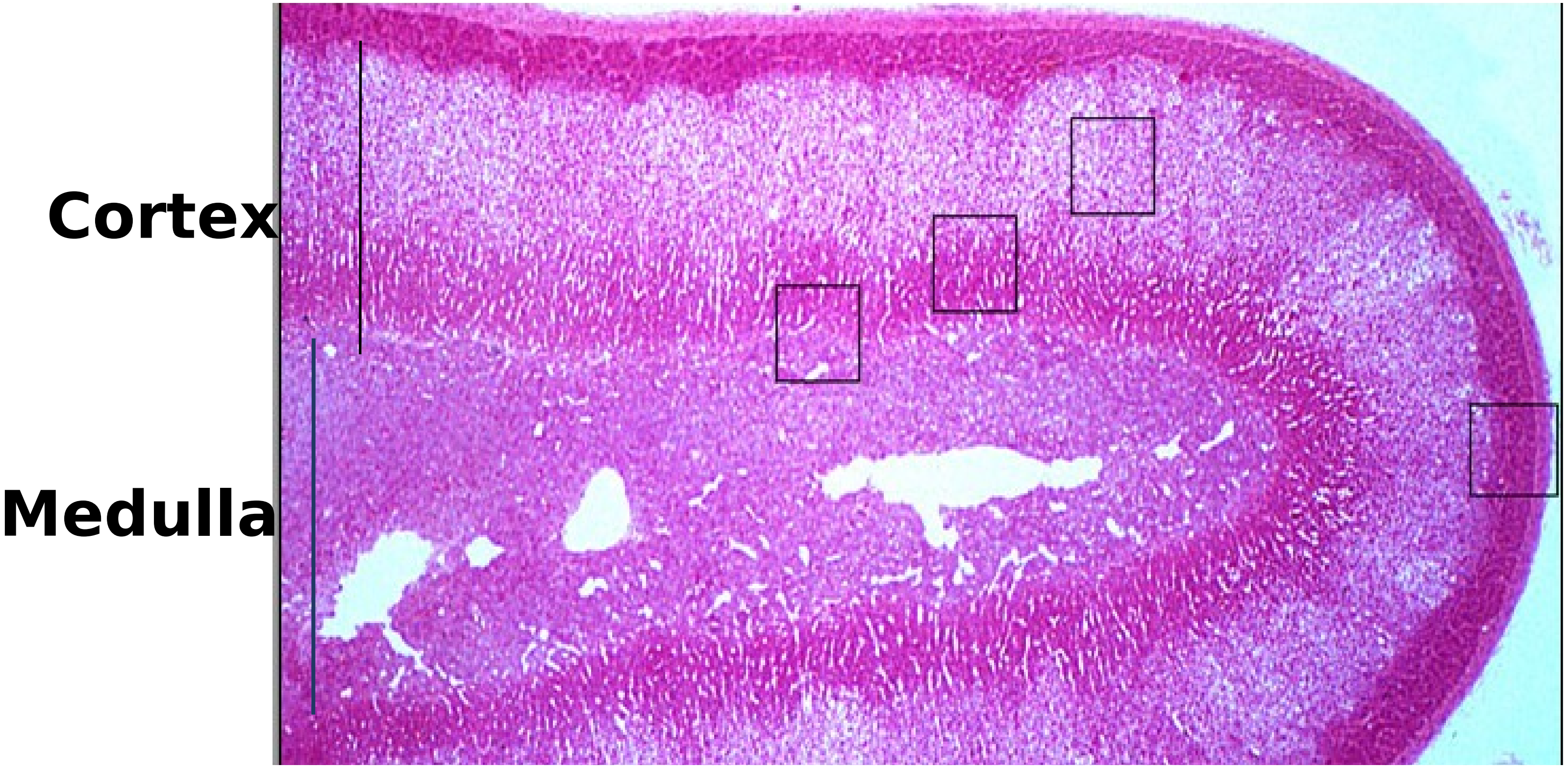
https://www.shutterstock.com/search/thryoid+parathyroid



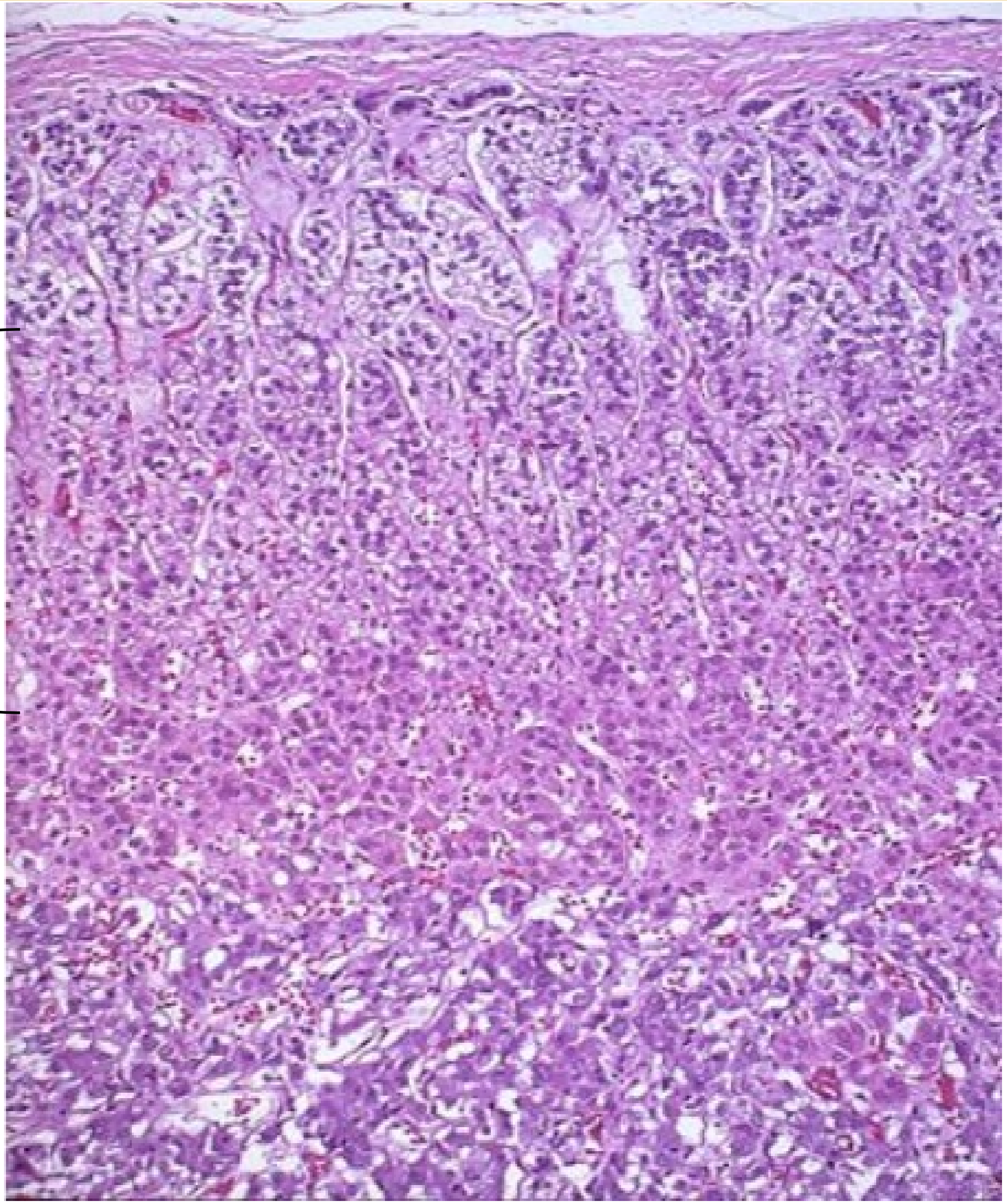
http://homepage.smc.edu/wissmann_paul/intranetstuff/dept/scienceLRC/wissmann_site/images/thyroid_histology2_Large.jpg

Suprarenal Gland





Suprarenal Gland



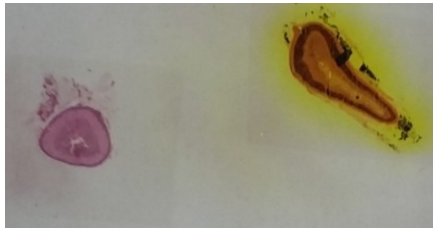
Zona Glomerulosa

Zona Fasciculata

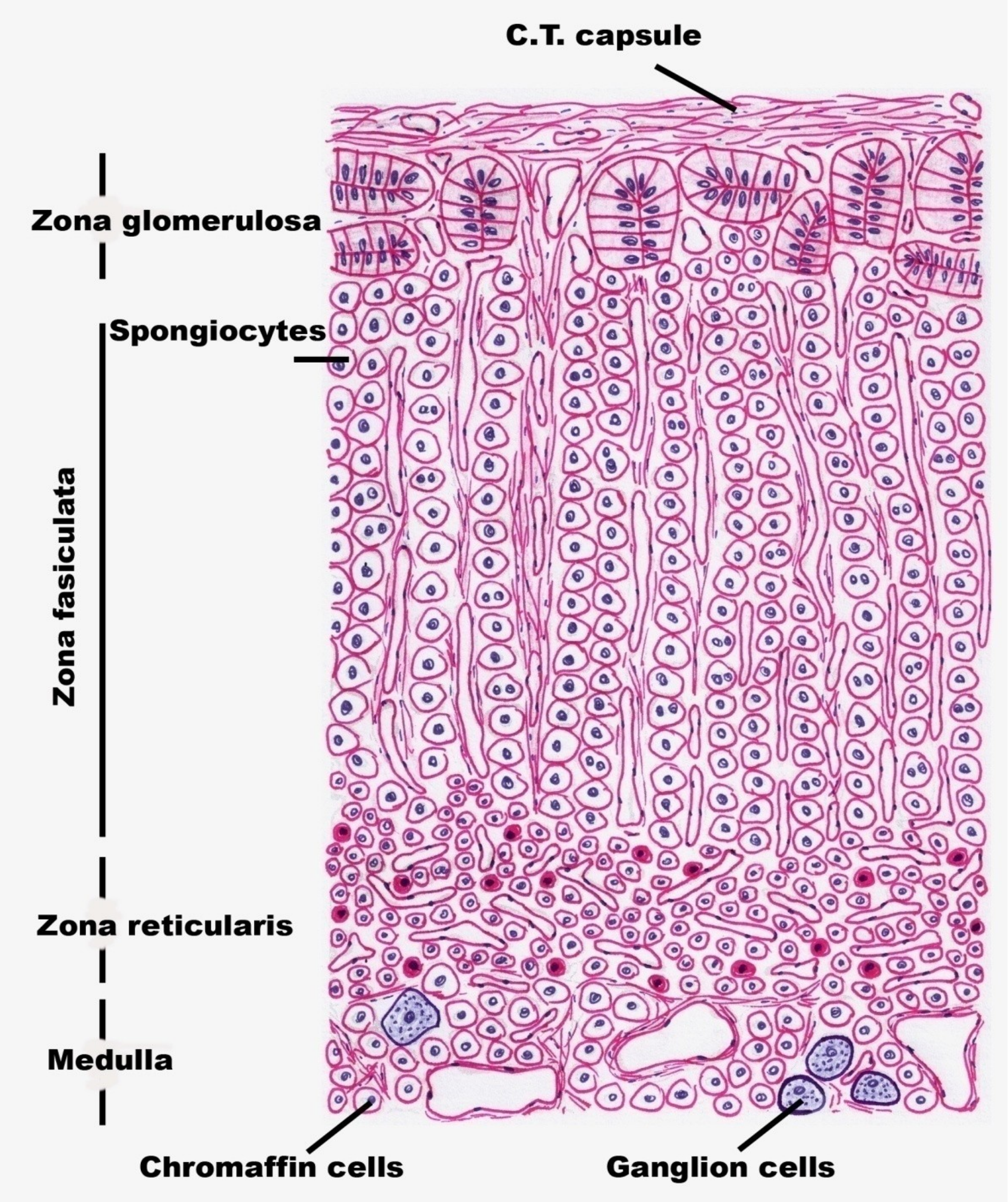
Zona Reticularis

cortex

Medulla

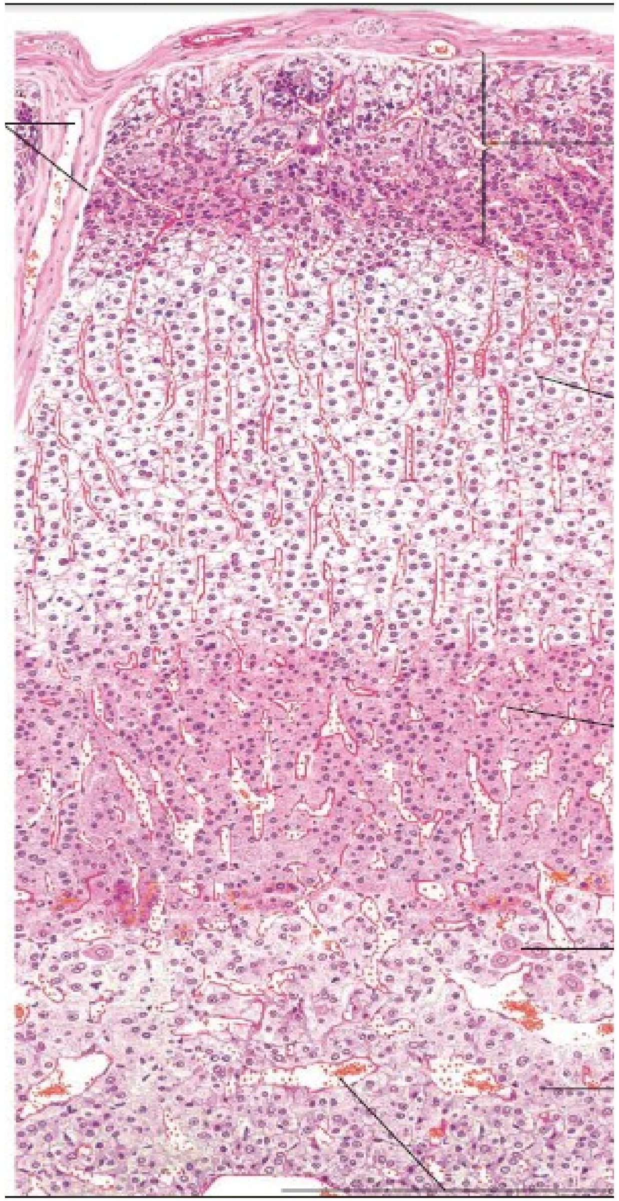


Suprarenal Gland

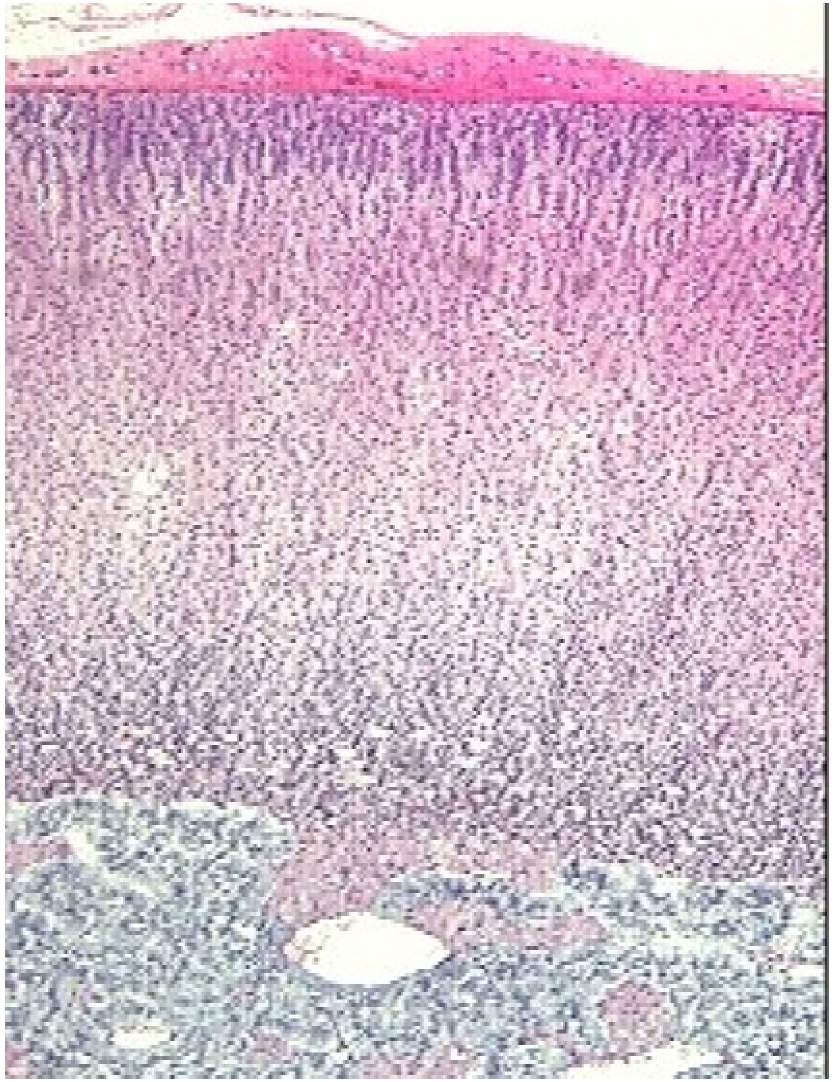


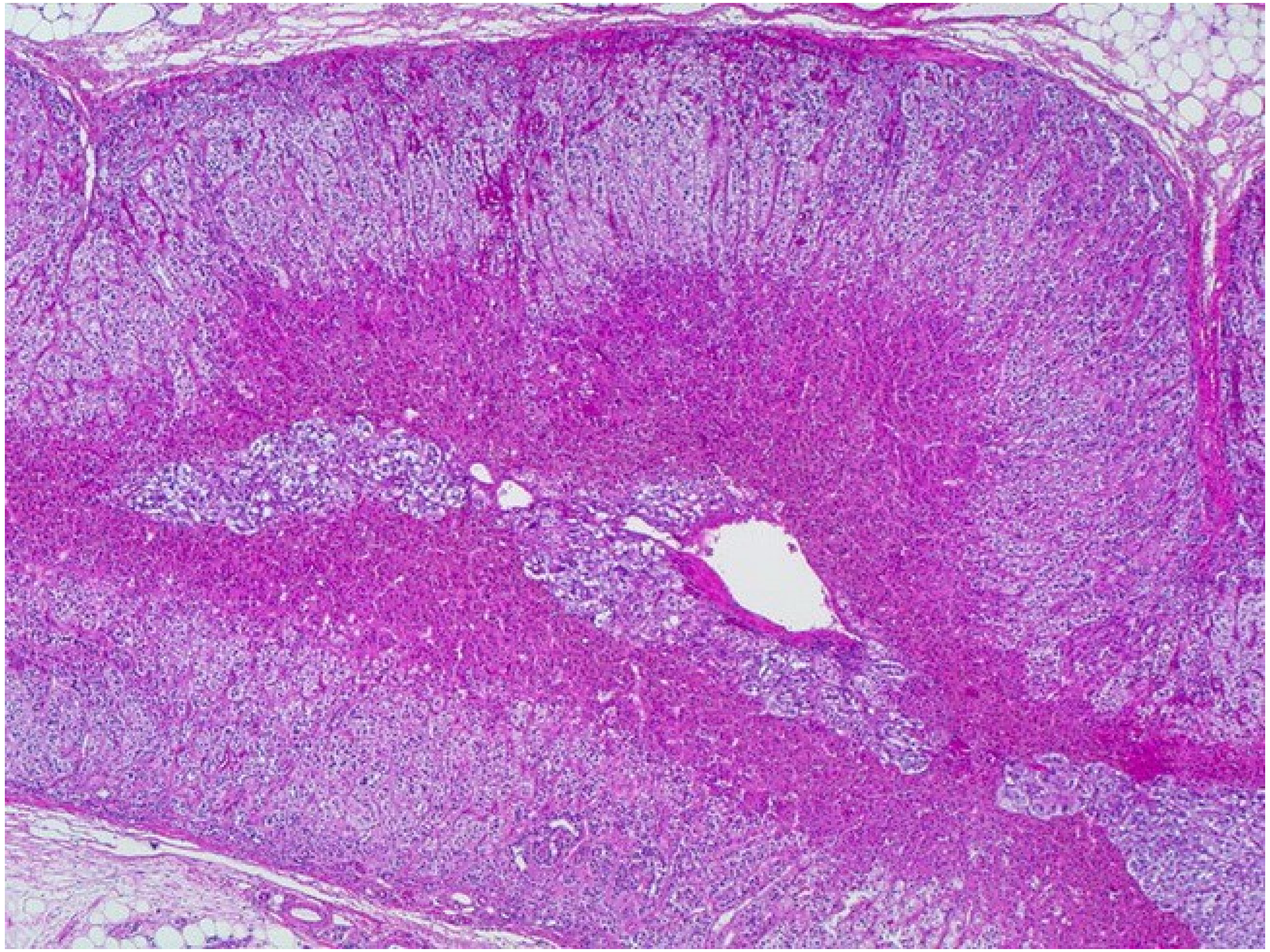
Suprarenal Gland

Name the zones



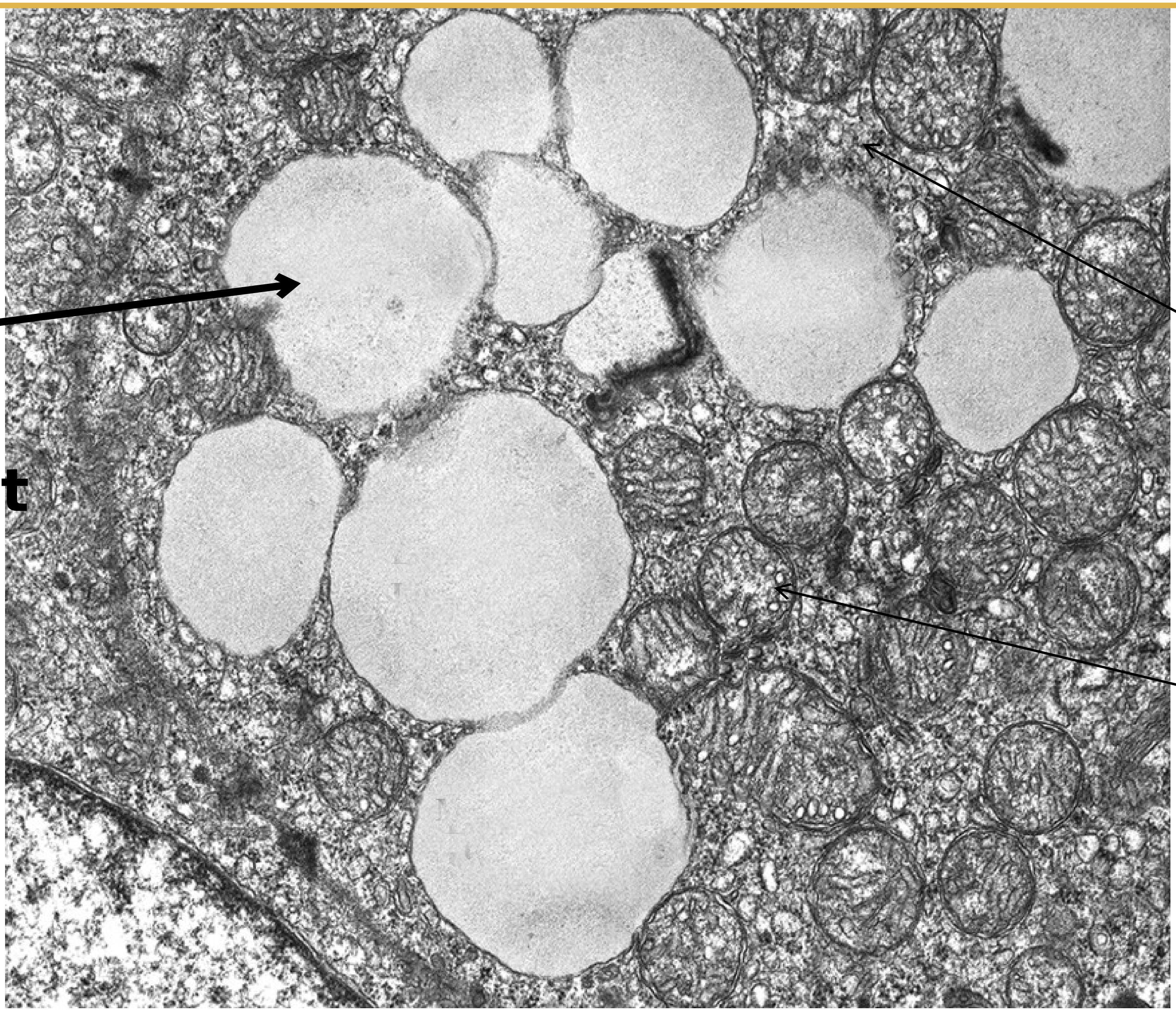
Suprarenal Gland





https://www.webpathology.com/image.asp?case=790&n=5

Steroid hormone secreting cell



Steroid hormone secreting cell

Label Steroid hormone secreting cell

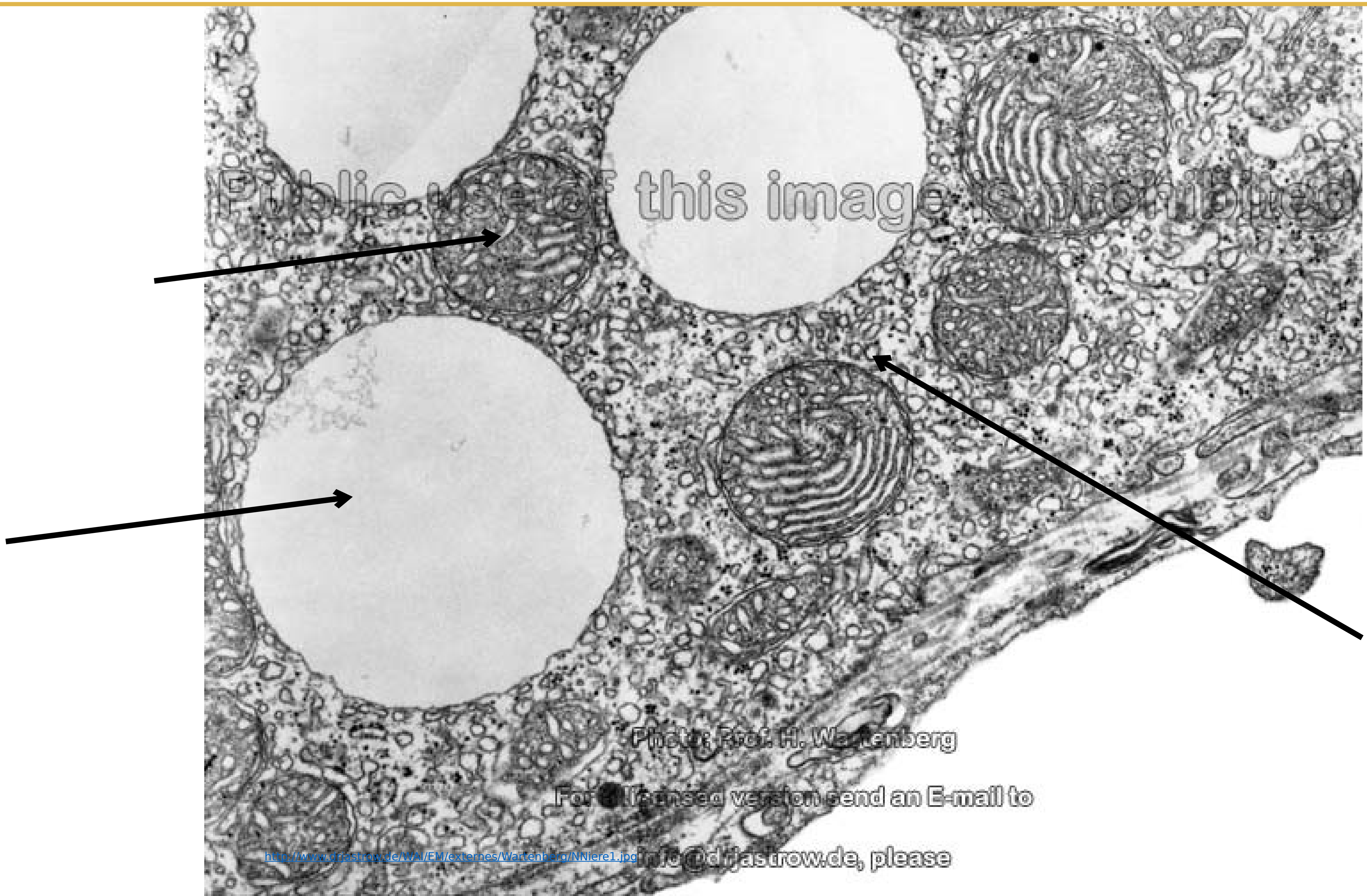


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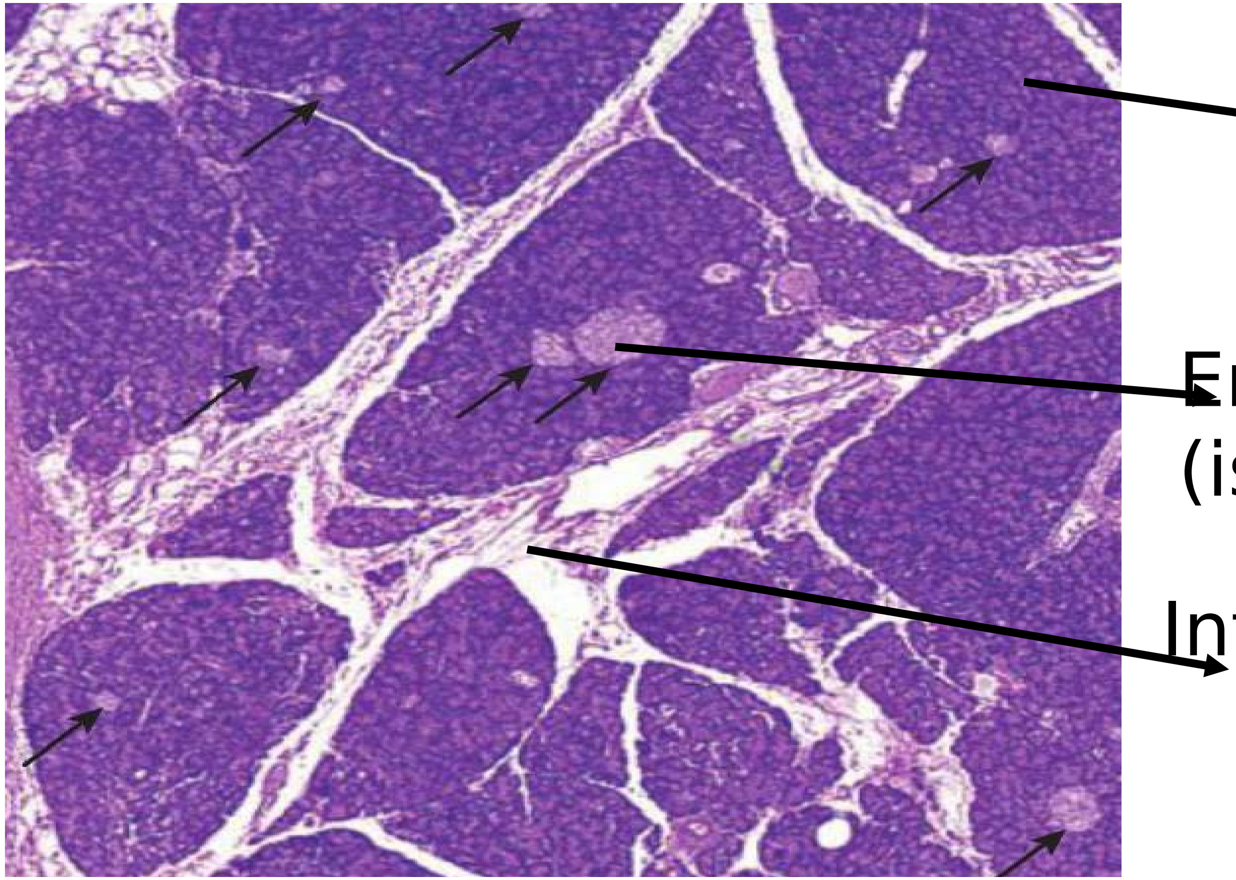
Photo: Prof. H. Wartenberg
For a licensed version send an E-mail to info@drjastrow.de, please

http://www.drjastrow.de/WAI/EM/externes/Wartenberg/NNiere1.jpg

Pancreas

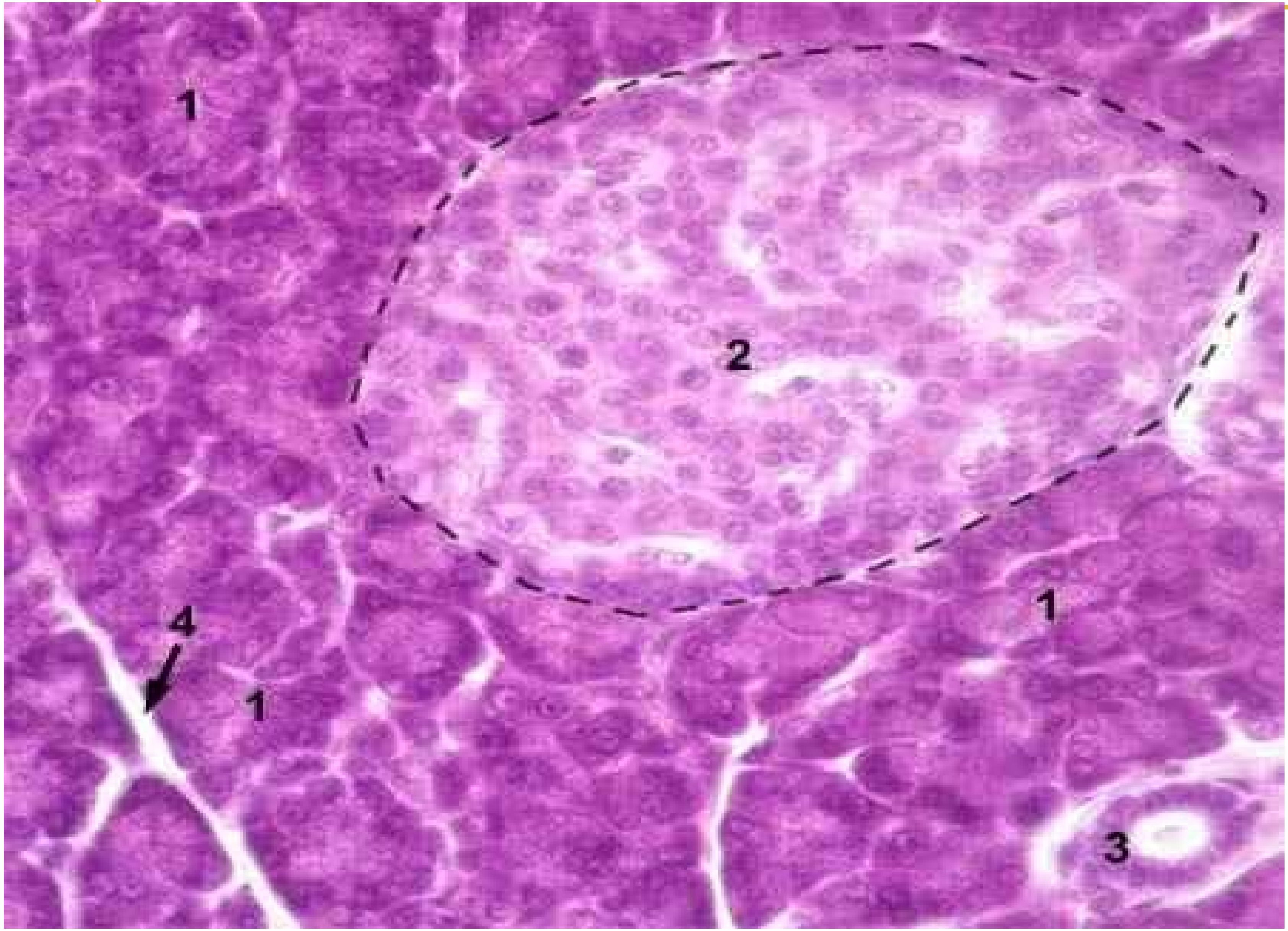


Exocrine portion
(serous acini)

Endocrine portion
(islet of Langerhan)

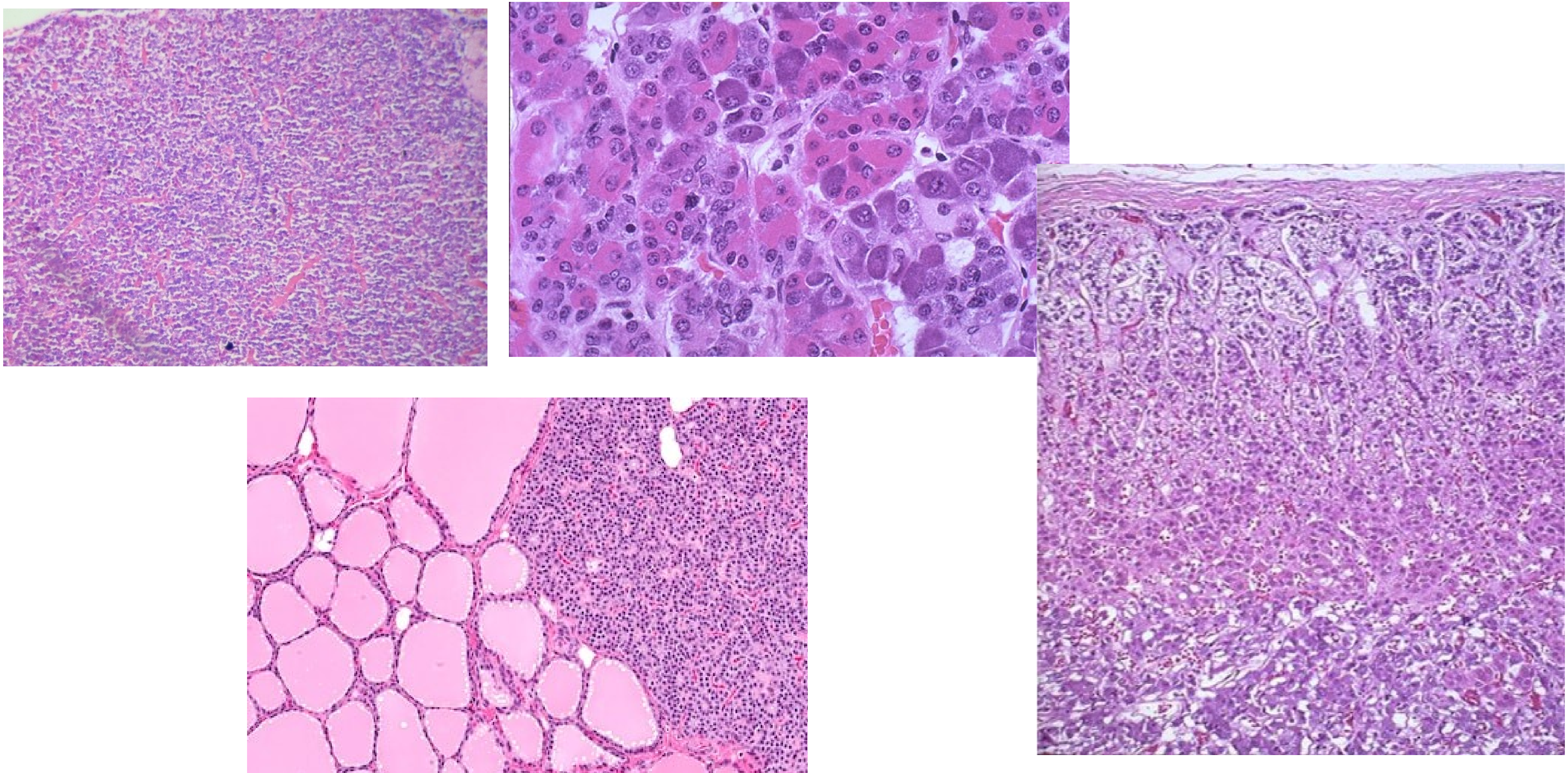
Interlobular septa

Pancreas

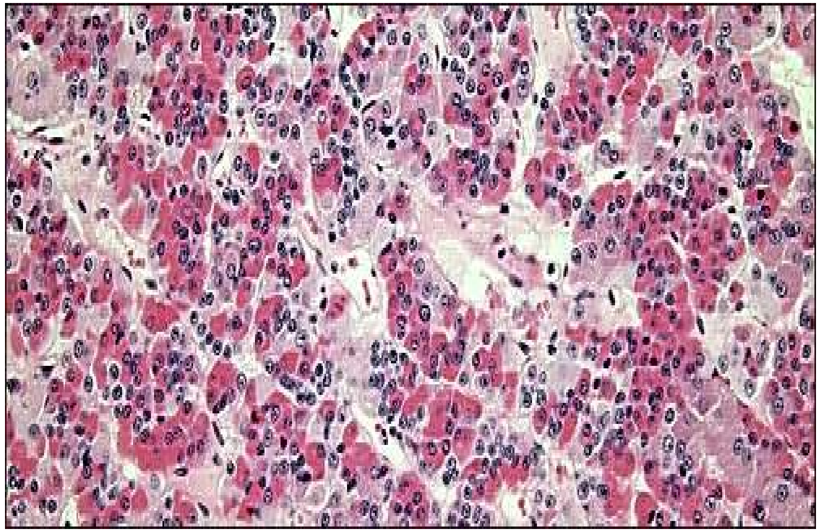


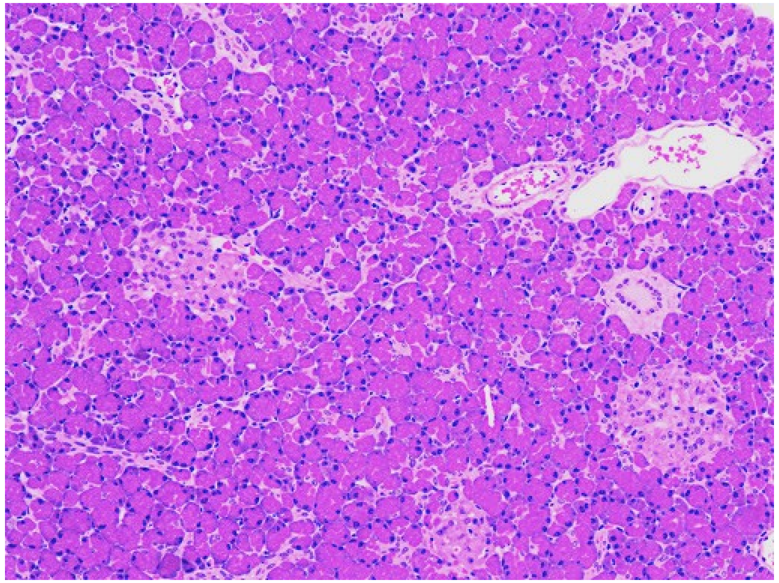
1- Serous acini
2- Islets of Langerhan
3- Duct
4- Interlobular septa

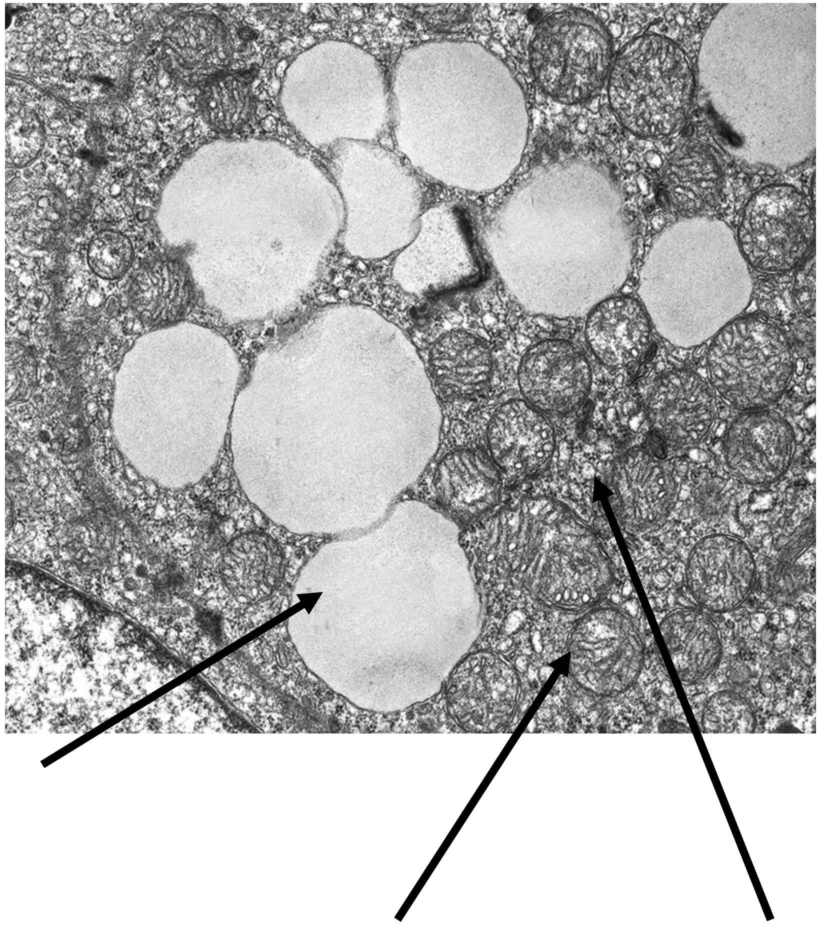
Test yourself

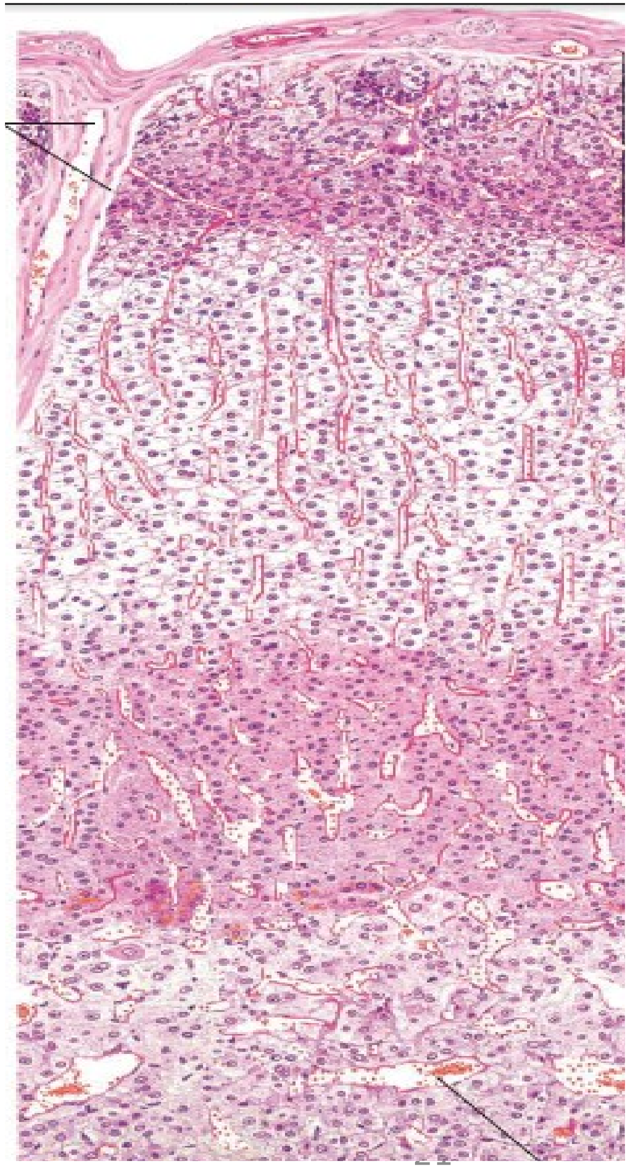


Test yourself









Formative exam

Quiz

A 30- year old patient complaining of changes in facial features that became coarse with protruded mandible and enlarged hands. This is due to over secretion of which of the following cells?

a. Corticotrophs
b. Gonadotrophs
c. Mamotrophs
d. Somatotrophs
e. Thyrotrophs

Oxytocin hormone is stored in Pars Nervosa in which of the following structures?

a) Pituicytes
b) Herring bodies
c) Supraoptic Nuclei
d) Myelinated axons
e) Paraventricular Nuclei

Quiz

Which of the following is the histological feature of the pituitary basophils?

a) Constitute 50% of chromophils

b) Rich in PAS negative granules

c) Branched neurosecretory cells

d) Rich in RER and small sized granules

e) Smaller but more numerous than acidophils

Quiz

A 35 year old field worker presented to the clinic with increased shoe size and tightness of ring, change in facial appearance, voice change, tingling and numbness in hands and snoring since 6 months. On examination his BP was160/100, elongated head, prominent supra orbital ridges, enlarged nose, lips, ear, widely spaced teeth, husky voice. This case is due to over-secretion of a cell that is characterized by

a- Richness in SER

b- Numerous lysosomes

c- Large secretory granules

d- Lamellopodia

Quiz

A 40 year old non-pregnant non-lactating female presented to clinic with whitish secretion from the nipple. This is due to over-secretion of which of the following cells?

a- Mammotrophs
b- Corticotrophs
c- Thyrotrophs
d- Somatotrophs
e- Gonadotrophs

Quiz

A young female presented to the clinic with polyurea and increased thirsty. Specific gravity of her urine was low. She was diagnosed as diabetes insipidus due to decrease in a release of hormone secreted by which of the following?

a- Pituicytes

b- Spongiocytes

c- Supraoptic nuclei

d- Somatotrophs

e- Corticotrophs

Quiz

A 20 year old female presented with secondary amenorrhea. The physician told her that she has to investigate her pituitary and hypothalamic functions. The hypothalamo–hypophyseal portal system conveys releasing hormones to control the cells that secrete FSH. Which of the following is a character these cells?

a- Numerous lysosomes

b- Prominent pinocytotic vesicles

c- PAS positive granules

d- Multivesicular bodies

e- Lipid droplets

Quiz

A young female presented to the clinic with polyurea and increased thirsty. Specific gravity of her urine was low. Diabetes insipidus was suspected. Which of the following occur during the secretion of the hormone responsible for this condition?

a- Synthesized in hypothalamus and transferred to pars distalis

b- Synthesized in Herring bodies of Pars nervosa

c- Synthesized in hypothalamus and stored in Herring bodies

d- Synthesized and secreted by the hypothalamus through portal circulation

Quiz

Pregnant women who have begun labor but in whom this process is no longer progressing are often given an IV injection of Pitocin to stimulate uterine contractions and facilitate parturition. Pitocin is a trade name of oxytocin, a hormone produced in what endocrine tissue?

a. Pars distalis
b. Ovarian follicles
c. Pars nervosa
d. Placenta
e. Pars tuberalis

Quiz

A premenopausal woman has a history of galactorrhea and amenorrhea. Prolactinoma is suggested. Which of the following is a histologic feature of the cells involved in this condition?

a. Numerous branches
b.Periodic acid shiff positive.
c.Acidophilic cytoplasm.
d.Rich in Lipid droplets.
e.Lack secretory granules.

Quiz

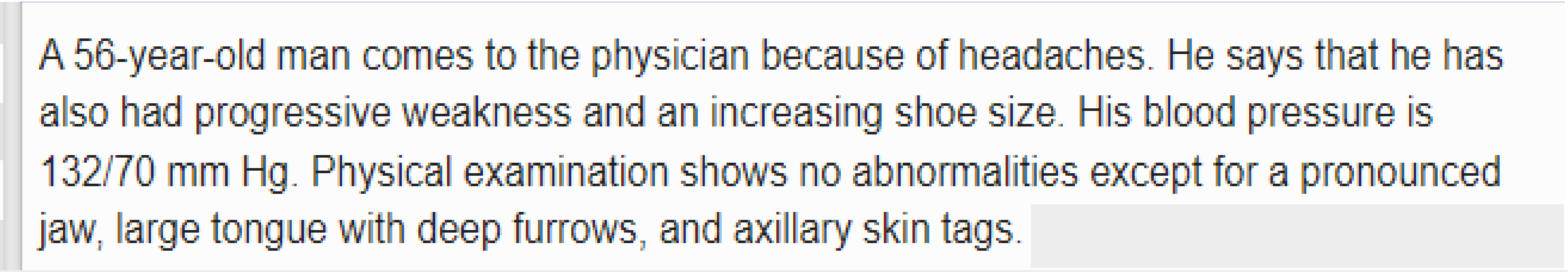
Which of the following supports the clusters of hormone secreting cells in pars distalis?

a. Fibrous astrocytes
b. Follicuolostellate cells
c. Pituicytes
d. Reticuloepithelial cells
e. Neuroglial cells

Which of the following are the supporting cells in pars nervosa?

a. Fibrous astrocytes
b. Follicuolostellate cells
c. Pituicytes
d. Reticuloepithelial cells

Quiz



A 56-year-old man comes to the physician because of headaches. He says that he has also had progressive weakness and an increasing shoe size. His blood pressure is 132/70 mm Hg. Physical examination shows no abnormalities except for a pronounced jaw, large tongue with deep furrows, and axillary skin tags.

Which of the following is the LM character of the cell responsible for this condition?

a. Eccentric pyknotic nucleus
b. Branches with tapering ends
c. Vacuolated cytoplasm
d. PAS positive granules
e. Acidophilic cytoplasm

Quiz

A 50 year old woman presented to the clinic with constipation and increased weight. Blood examination showed reduced T3. Biopsy from thyroid gland is expected to show which of the following?

a- Highly basophilic follicular cells

b- Increased number of parafollicular cells

c- Flatenned thyrocytes

d- Excess lamellopodia from the thyrocytes

e- Vacuolated thyroglobulin

Quiz

A 52-year-old woman complains of swelling in the anterior portion of her neck that she first noticed 6 months ago. Except for some discomfort during swallowing, the patient does not report any significant symptoms. Laboratory studies show elevated serum levels of thyroid hormones. These hormones are synthesized and secreted by which of the following endocrine cells?

a- Chief cells

b- Follicular cells

c-Leydig cells

d- Oxyphil cells

Quiz

A 52-year-old woman complains of swelling in the anterior portion of her neck that she first noticed 6 months ago. Except for some discomfort during swallowing, the patient does not report any significant symptoms. Laboratory studies show elevated serum levels of thyroid hormones. Which of the following is the character of the endocrine cells secreting this hormone?

a- Numerous SER

b- Mitochondria with tubular crista

c- Lysosomes and RER

d- Peroxisomes and Proteasomes

Quiz

A 48-year-old woman presents with flank pain. Laboratory studies show elevated serum levels of parathyroid hormone (PTH) and calcium. Imaging studies reveal stones in the patient’s right renal pelvis and ureter. Which of the following endocrine cells secretes a polypeptide hormone that opposes the action of PTH and decreases serum calcium levels in this patient?

(A) Chief cells

(B) Follicular cells

(C) Leydig cells

(D) Oxyphil cells

Quiz

Using indirect immunofluorescence assays, a monoclonal antibody directed against thyroperoxidase enzyme will specifically binds (labels)which of the following membranes within the thyroid gland?

(A) Apical membranes of capillary endothelial cells
(B) Apical membranes of follicular epithelial cells
(C) Basolateral membranes of capillary endothelial cells
(D) Basolateral membranes of follicular epithelial cells
(E) Plasma membranes of parafollicular cells

Quiz

Which of the following cells is rich in SER?

a. Pituicyte
b. Thyrocyte
c. Melanocyte
d. Spongiocyte
e. Chief cells

Which of the following organelles increase in mammotrophs after end of lactation?

a. Lysosomes
b. Endosomes
c. Peroxisomes
d. Proteasomes
e. Microtubules

Quiz

Which of the following is numerous in the Cells of suprarenal cortex?

a. RER and SER
b. RER and mitochondria
c. SER and mitochondria
d. RER and Golgi
e. RER and lysosomes

A 50 year old male presented with muscle twitches and pallor. X-ray showed dense bones. He had diminished calcium level. This is due to hypofunction of:

a. Parafollicular cells
b. Thyrocytes
c. Pinealocytes
d. Chief cells of parathyroid
e. Oxyphil cells

Quiz

Iodination of the thyroglobulin occur in which of the following areas of the thyroid follicles?

a. Follicular cells
b. Parafollicular cells
c. Lumen of thyroid follicles
d. Interfollicular cells
e. Blood of surrounding capillaries

The follicular cells secrete T3 and T4 through which of the following surfaces?

a. Apical microvilli
b. Apical cilia
c. Basolateral border
d. Apical lateral border
e. Any border

Quiz

A patient presented with rapid pulse rate and is losing weight. On examination, there was excess sweating and enlargement of the thyroid gland. Histologically, it will show which of the following features?

a. Flat follicular cells and large amount of colloid
b. Cuboidal follicular cells with large amount of thyroglobulin
c. High cuboidal follicular cells and diminished amount of colloid
d. Increased SER and diminished amount of colloid
e. Lack of apical thyroperoxidase enzyme and little colloid

Quiz

A 45 year old woman presented to the clinic with constipation and increased weight. Blood examination showed reduced T3. Biopsy from thyroid gland is expected to show which of the following?

a- Basophilic follicular cells with vesicular nucleus
b- Decreased festooned colloid
c- Low cuboidal thyrocytes
d- Excess microvilli containing thyroperoxidase
e- Vacuolated thyroglobulin

Quiz

A thyroid biopsy is obtained from a very slim 46-year-old woman with an enlarged thyroid gland. The pathologist noticed clear vacuoles in the colloid, next to the apical surface of the follicular epithelium. What is the biological significance of this histologic finding?

a- Failure of thyroglobulin iodination

b- Decreased section of thyroxin

c- Decreased thyroglobulin synthesis

d- Increased secretion of triglycerides

e- Increased thyroglobulin uptake

Quiz

A middle aged female presented trunkal obesity and muscle wasting of the limbs. Investigations showed high serum cortisol level. This is due to hyperfunction of which of the following?

a. Somatotroph
b. Mammotrophs
c. Corticotrophs
d. Thyrotrophs
e. Gonadotrophs

Quiz

A newborn female is discovered to have ambiguous genitalia. Virilization of female genitalia in this neonate was most likely caused by increased production of androgens by which of the following fetal cells?

a- chromaffin cells in adrenal medulla

b- Cells in the zona reticularis

c- Thyrocytes

d- Pituicytes

e- Spongiocytes

Quiz

A 48-year-old woman presents with flank pain. Laboratory studies show elevated serum levels of parathyroid hormone (PTH) and calcium. Imaging studies reveal stones in the patient’s right renal pelvis and ureter. Which of the following endocrine cells secretes a polypeptide hormone that opposes the action of PTH and decreases serum calcium levels in this patient?

(A) Chief cells

(B) Follicular cells

(C) Leydig cells

(D) Oxyphil cells

(E) Parafollicular cells

Quiz

A 48-year-old woman presents with flank pain. Laboratory studies show elevated serum levels of parathyroid hormone (PTH) and calcium. Imaging studies reveal stones in the patient's right renal pelvis and ureter. Which of the following is abundant the cells responsible for this condition?

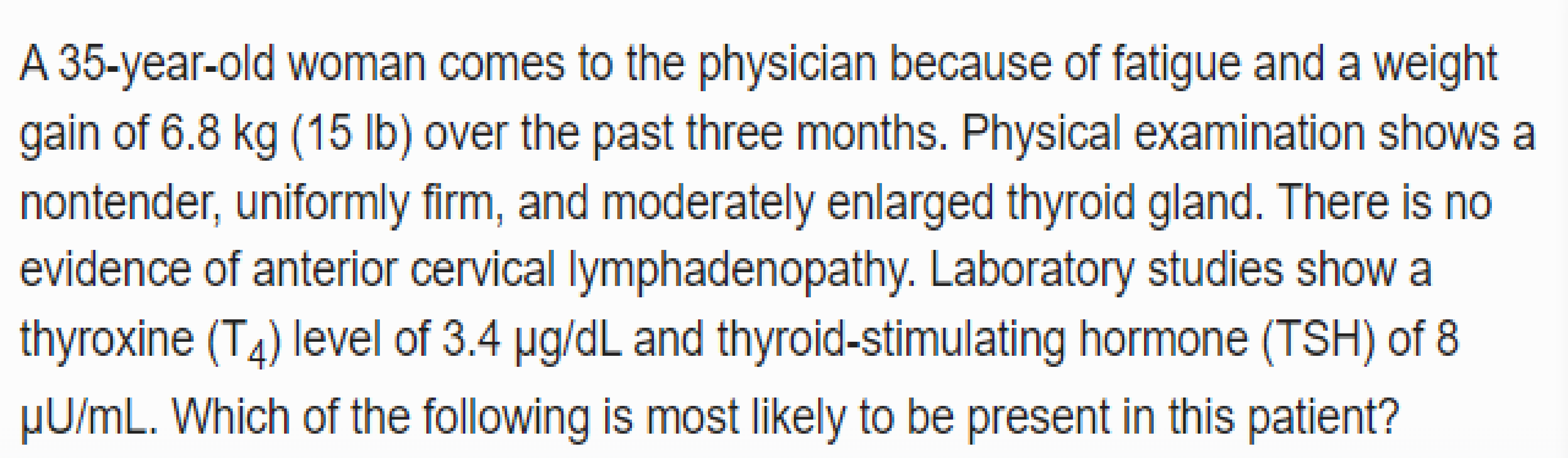
(A) SER
(B) RER
(C) Fat droplets
(D) Lysosomes
(E) Lipofucsin pigment

Quiz

As part of your research on mechanisms of thyroid hormone secretion, you develop a monoclonal antibody directed against the sodium/iodide cotransporter (symporter). Using indirect immunofluorescence assays, you demonstrate that this antibody specifically binds (labels) which of the following cells and membranes within the thyroid gland?

(A) Apical membranes of capillary endothelial cells
(B) Apical membranes of follicular epithelial cells
(C) Basolateral membranes of capillary endothelial cells
(D) Basolateral membranes of follicular epithelial cells

Quiz



A 35-year-old woman comes to the physician because of fatigue and a weight gain of 6.8 kg (15 lb) over the past three months. Physical examination shows a nontender, uniformly firm, and moderately enlarged thyroid gland. There is no evidence of anterior cervical lymphadenopathy. Laboratory studies show a thyroxine (T_4) level of 3.4 µg/dL and thyroid-stimulating hormone (TSH) of 8 µU/mL. Which of the following is most likely to be present in this patient?

Small follicles with little colloid content
Large tall follicular cells with vacuolated colloid
Low flat follicular cells with large amount of colloid
Large follicles lined by tall follicular cells and festooned colloid
Small follicles with predominant parafollicular cells

Quiz

A 40-year-old female presented to the clinic complaining of heat intolerance and losing weight. She had rapid pulse and high blood pressure. ^{99m}technetium scintigraphy scan on the thyroid gland showed hot nodule. If a biopsy was taken from the thyroid, what is the expected microscopic appearance?

a. Flat follicular cells and accumulation of colloid
b. High follicular cells with decrease in colloid
c. Flat follicular cells with decrease in colloid
d. High follicular cells with accumulation of colloid
e. Flat follicular cells with vacuolated colloid

Quiz

On examining thyroid sections, it is important to comment on the thyroglobulin content. In normal thyroid follicles, which of the following is a character of thyroglobulin?

a) Glycoprotein in nature
b) PAS negative
c) Synthesized by parafollicular cells
d) Iodinated intracellularly
e) Vacuolated basophilic material

Quiz

Yor are examining a thyroid gland removed surgically after an operation of subtotal thyroidectomy. You find pale cells that line the follicles but do not reach the lumen. What is the name of these cells?

a. Chief cells
b. Parafollicular cells
c. Oxyphil cells
d. Thyrocytes
e. Follicular cells

Quiz

The follicular cells of the thyroid follicles are rich in which of the following organelles/ inclusions?

a. Mitochondria with vesicular cristae
b. Abnormally shaped mitochondria
c. Lysosomes and endosomes
d. Smooth endoplasmic reticulum
e. Lipids and glycogen

Quiz

A 40-year-old woman complains of recent changes in her body appearance, including upper truncal weight gain and moon facies. Endocrine studies reveal elevated serum levels of cortisol and ACTH. The patient is subsequently diagnosed with Cushing disease. ACTH is synthesized primarily by endocrine cells in which of the following?

a- Adrenal cortex, zona fasciculata

b- Adrenal cortex, zona glomerulosa

c- Adrenal cortex, zona reticularis

d-Pars distalis of pituitary

e-Neurohypophysis

Quiz

A 45-year-old man complains of truncal obesity and moon facies. Endocrine studies reveal elevated serum levels of cortisol and ACTH. The patient is subsequently diagnosed with Cushing disease. The cells secreting cortisol is characterized by which of the following?

a- basophilic cytoplasm

b- eccentric nucleus

c- numerous lysosomes

d- smooth endoplasmic reticulum

e- numerous pinocytotic vesicles

Quiz

A 53-year-old man complains of muscle weakness and dizziness of 3 months' duration. His blood pressure is elevated (185/100 mm Hg). Endocrine studies reveal elevated serum levels of aldosterone. This is due to over secretion of which of the following cells?

A) Adrenal cortex, zona fasciculata

B) Adrenal cortex, zona glomerulosa

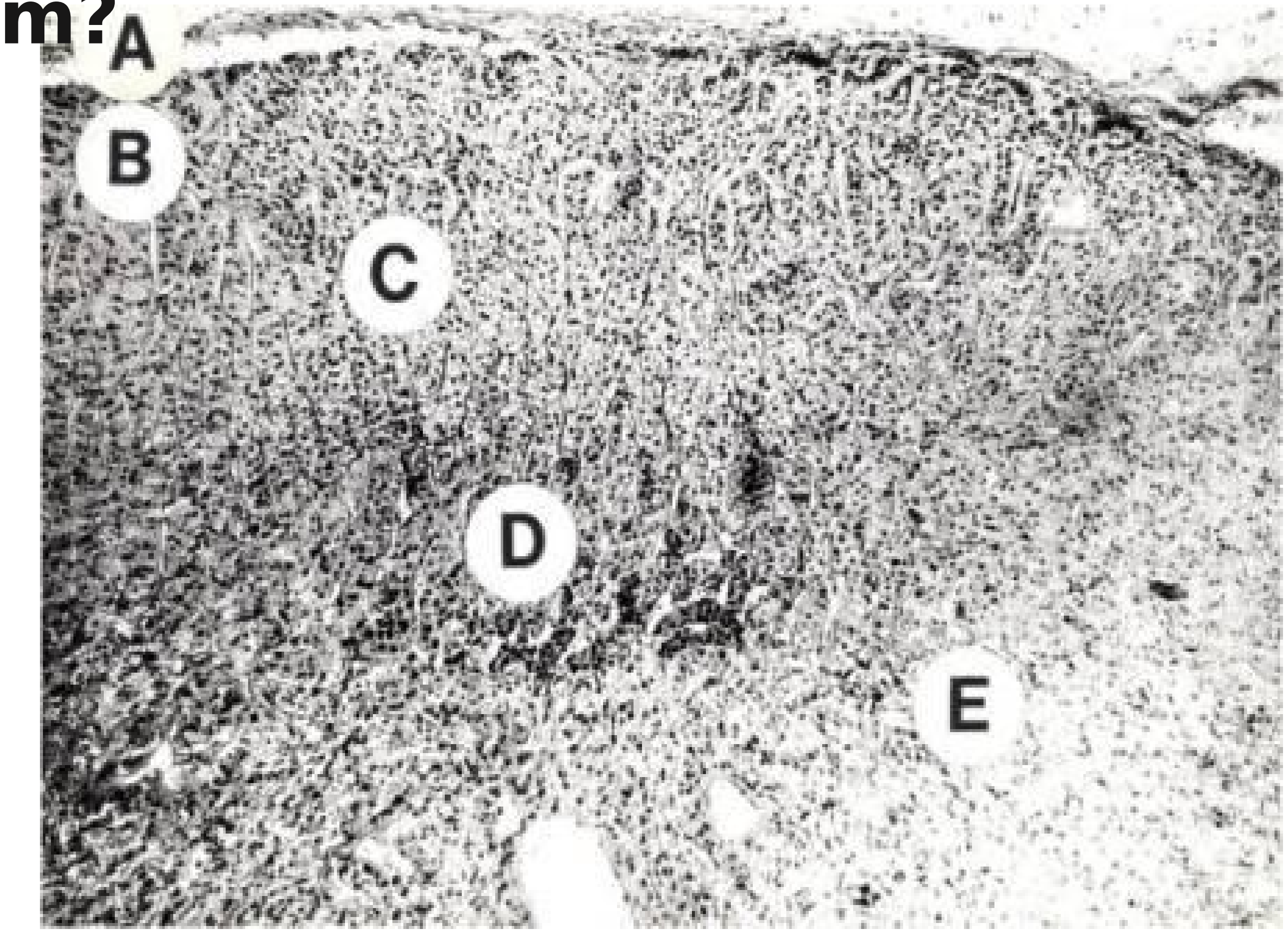
C) Adrenal cortex, zona reticularis

D) Adrenal medulla

E) Anterior pituitary

Quiz

Which of the labelled structures in the provided light micrograph of the adrenal gland, is the thickest layer of the cortex and has the most abundant lipid droplets in its cytoplasm?



Quiz

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a- basophilic cytoplasm

b- eccentric nucleus

c- numerous lysosomes

d- smooth endoplasmic reticulum

e- numerous pinocytotic vesicles

Quiz

A 45-year-old man complains of truncal obesity and moon facies. Endocrine studies reveal elevated serum levels of cortisol. The patient is subsequently diagnosed with Cushing disease. The cells of the suprarenal gland responsible for this condition are characterized by which of the following?

a. Basophilic cytoplasm with secretory granules
b. Eccentric deeply stained nucleus
c. Smooth endoplasmic reticulum with lipid droplets
d. Numerous lysosomes and lipofuscin pigment
e. Arrangement in the form of arches under the capsule

Quiz

A twenty-year-old female presented to the clinic because of increased weight gain and polyurea. Examination showed abdominal stria. Hormonal assay showed increased cortisol level. The cells that secrete this hormone are characterized by

a- Secretory granules

b- Prominent RER

c- Apical microvilli

d- Lipid droplets

e- numerous lysosome

Quiz

A 17-year male presented to the clinic with headache. Examination showed increased blood pressure. Hormonal assay showed increased norepinephrine level. This condition is due to over-secretion of cells that are characterized by:

a- Central deeply stained nuclei

b- Positive chromaffin reaction

c- PAS positive granules

d- Prominent SER

e- Numerous lysosomes

Quiz

Which of the following cells are arranged in arches under the capsule of the suprarenal gland?

a) Cells producing DHEA
b) Cells producing aldosterone
c) Cells acting as stem cells
d) Cells secreting cortisol
e) Cells undergoing apoptosis

Quiz

A 75-year-old man presented to the emergency room after a car accident. X-ray skull showed white spots of brain sand. This is due to calcification in which of the following gland?

a- Hypothalamus
b- Pineal body
c- Pars distalis
d- Pars nervosa
e- Median eminence

Quiz

An 8 year old male presented with harsh voice and hairs in his chin. He was diagnosed as precocious puberty. This is due to defective function in which of the following?

a- Spongiocytes
b- Pituicytes
c- Pinealocytes
d- Gonadotrophs
e- Reticulocytes

Quiz

An 8 year old male presented with harsh voice and hairs in his chin. He was diagnosed as precocious puberty. This is due to defective function in a cell characterized by which of the following?

a- Mitochondria with tubular cristae
b- GFAP protein positive
c- Long branches containing microtubules
d- RER and large electron dense granules
e- Positive chromaffin granules

Quiz

People with seasonal affective disorders suffer depression in winter with short days. This is due to disturbance in the function of which of the following?

a- Spongiocytes

b- Pituicytes

c- Pinealocytes

d- Gonadotrophs

e- Reticulocytes

Quiz

A 24-year-old flight attendant asks you about the physiology of the "jet lag" that she experiences when returning from her flights to the United States. Which of the following cells is most likely the responsible one?

–

a) Pinealocytes
b) Chromaffin cells
c) Chief cells
d) Spongiocytes
e) Pituicytes

Quiz

A 60-year-old diabetic male was shifted to insulin therapy as he had elevated HbA1c. The cells that normally secrete this hormone are characterized by which of the following?

a. Deeply acidophilic cytoplasm rich in smooth endoplasmic reticulum

b. Large in size and situated at the periphery of the islets of Langerhans

c. Small in size and situated in the center of the islets of Langerhans

Quiz

A type II diabetic patient was shifted to insulin therapy due to the start of renal complications. How can you identify the cells secreting this hormone in the islets of Langerhans under the microscope?

a. Acidophilic cells with homogenous granules
b. Small cells with granules having dense crystalloid core
c. Small cells arranged in the form of follicles
d. Large cells distributed all over the islet of Langerhans
e. Cells with branches ending on continuous capillaries

Quiz

Considering how pancreatic islets are perfused and how pancreatic hormones act in a paracrine manner, which of the following can occur?

a. Alpha cells inhibit beta cells
b. Delta cells inhibit alpha cells
c. Beta cells stimulate Alpha cells
d. Delta cells stimulate Beta cells
e. Alpha cells inhibit Delta cells

Beta cells have a control on the secretory activity of the other cells in the islets of Langerhans. How could this control occur by a method other than paracrine regulation?

a) Gap junction
b) Tight junction
c) Desmosomes
d) Fascia adherens

Quiz

Which of the following is a distinctive EM structure of the cells of zona reticularis of suprarenal cortex?

a. lysosomes.
b. Lipofuscin pigments
c. Secretory granules.
d. Lamellopodia.
e. Free ribosomes

The para-follicular cells of the thyroid follicles are rich in which of the following structures?

f. Peroxisomes
g. Proteasomes
c. Lysosomes
d. Free ribosomes
e. Secretory granules

Vasopressin hormone (ADH) enters the systemic circulation through fenestrated capillaries that are present in which of the following locations?

(A) Median eminence of the infundibulum
(B) Paraventricular nucleus of the hypothalamus
(C) Pars distalis of the anterior pituitary
(D) Pars nervosa of the posterior pituitary
(E) Pars tuberalis of the anterior pituitary

Which of the following is a distinctive EM feature of the spongiocytes of suprarenal cortex?

a. Lysosomes.
b. Lipid droplets
c. Free ribosomes.
d. Dense granules.
e. Lamellopodia.

Quiz

Which of the following is expected to be relatively more abundant in the parathyroid gland of elderly people?

a. Oxyphil cells
b. Chief cells
c. Calcified matrix
d. Fibroblasts
e. Macrophages

Pars nervosa contains which of the following components?

a. Somatotropes and chromophobes
b. Corticotrophs and herring bodies
c. Pituicytes and herring bodies
d. Spongiocytes and supraoptic nuclei

Quiz

1- Acidophils include ------------------------------------

Basophils include -------------------------------------

Acidophils include somatotrophs and mammotrophs
Basophils include thyrotrophs, corticotrophs, gonadotrophs

2- Herring bodies seen in pars nervosa represent ------------------------

Dilated axon terminals containing accumulation of neurosecretory vesicles, mitochondria, few microtubules

Quiz

In a table, compare between acidophils and basophils

	Acidophils	**Basophils**
%	35-40%	10-15%
Size	Smaller	Larger
LM stain	Acid stains	Basic stains
	Oval or rounded, vesicular nucleus	
Granules PAS	PAS -ve	Small, less numerous PAS+ve
EM	RER, Golgi, mitochondria	RER, Golgi, mitochondria, **small** granules of variable electron density
Types	**Somato., Mammo**	**Thyro, Cortico, Gonado**
Control	R and I (from hypoth.)	R, -ve feedback by end hormones

Quiz

Q 4- Apical border of thyrocytes is characterized by-----------------, -------------------
At the basolateral border of thyroid follicular cells, there is uptake of----------------and release of----------------------

Apical border of thyrocytes is characterized by apical microvilli containing thyroperoxidase enzyme, lamellopodia
At the basolateral border of thyroid follicular cells, there is uptake of iodide from blood stream by sodium iodide symport and uptake of tyrosine and release of active thyroid hormone T3 and T4.

Quiz

Give reasons

1- Granules of basophils are PAS positive

because the hormone they produce is glycoprotein in nature

2- Thyrocytes are rich in lysosomes

Lysosomes fuse with the endocytotic vesicles containing iodinated thyroglobulin to hydrolyse the thyroglobulin liberating active thyroid hormones T3 & T4.

3-Few colloid is present in the thyroid follicles of hyperactive glands

because of increased thyroglobulin uptake by thyrocytes to produce active thyroxin hormone

Quiz

Give reasons

4- Absence of hormone secreting cells in pars nervosa

Vasopressin (ADH) and Oxytocin are synthesized in Nerve cells in supraoptic & paraventricular nuclei in hypothalamus which then
1- transport down the axon bound to a carrier protein neurophysin
2- stored in axon terminals as Herring bodies in the pars nervosa
3- released in fenestrated capillaries

5- Oxyphil cells of parathyroid gland are deeply acidophilic

Because it contains numerous abnormally shaped mitochondria

Quiz

Give reasons

oplasm of Chief cells of parathyroid gland contain vacuoles

Because their cytoplasm is rich in lipid and glycogen which appear as clear areas

Brain sand is seen in x-ray of skull in old age

Because they are calcified concretions, called corpora arenacea or brain sand in the pineal body which are due to extracellular protein deposits that become mineralized and appear by x-ray and increase with age

3- Dietary iodine deficiency result in enlargement of thyroid gland

Because thyroglobulin will not be iodinated and so will not be endocytosed by the follicular cells and accumulate in the lumen

Quiz

Give reasons

1- Spongiocytes appear vacuolated

Because they are filled with **lipid droplets** containing cholesterol esters. Lipids dissolve during preparing the histological sections so cytoplasm has vacuolated spongy appearance

2- Presence of fenestrated capillaries in suprarenal cortex

For hormones produced by the cells of suprarenal cortex to pass through the pores the fenestrated endothelial capillaries to the blood

Presence of dark cells in the zona reticularis

They have dark nuclei and lipofuscin pigment representing degenerated cells

Absence of granules in the zona fasciculata

Steroid hormones are *not* stored in granules. They diffuse freely from cells through the plasma membrane as they are small lipid soluble molecules.

Quiz

Give reasons

1- Cells of zona fasciculata are called spongiocytes

Because they are filled with **lipid droplets** containing cholesterol esters. Lipids dissolve during preparing the histological sections so cytoplasm has vacuolated spongy appearance

- Fresh suprarenal cortex appear yellow

Because they are filled with **lipid droplets.**

Cells of suprarenal cortex appear acidophilic

They have many Mitochondria with tubular cristae and SER with few RER

Cells of suprarenal cortex are rich in mitochondria

Mitochondria with tubular cristae to produce ATP and they also contain enzymes that convert cholesterol to pregnolone sharing in steroid hormone synthesis

Quiz

are between the different cells in the islets of Lang

Cell	%	Site in the islet	structure	Hormone produced	Function
Alpha cells **α-cells**	20%	Peripheral	Large cell, uniform granules	Glucagon	Increase blood glucose level (glycogenolysis)
Beta cells **β cells**	70%	Central	Small cell, dense core granules	Insulin	Decrease blood glucose level
D cells **δ cells**	5%	Peripheral	Large secretory granules with lower electron density	Somatostain	Inhibitory Inhibits release of other islet cell hormones by local paracrine action

Quiz

Cells in the suprarenal cortex zona fasciculata are arranged in the form of ---------------------------------------

Their specific organelles include--------------------,--------------------------

Cells in the suprarenal cortex zona fasciculata are arranged in the form of columns of 1 or 2 cell thick arranged at right angles to the surface separated by fenestrated capillaries.

Their specific organelles include SER (in the form of interconnecting branching and anastomosing tubules containing enzymes for cholesterol synthesis and conversion of steroid prohormone pregnenolone into specific active steroid hormones), Mitochondria with tubular cristae (for ATP and enzymes that convert cholesterol to pregnolone)

Quiz

Compare between the different zones of suprarenal cortex

	Z. glomerulosa	z. fasciculata	z. reticularis
LM cell **shape**	Columnar	Polyhydral Most vacuolated	Smaller, rounded Some cells are dark
cell **arrangement**	arches	columns	Branching cords
Stain	Pale acidophilic	Highly vacuolated	More densely stained because of less lipid content
EM	SER and mitochondria with tubular cristae, lipid		
Function	Aldosterone	Cortisol	DHEA

Quiz

Describe the ultrastructural changes in mammotrophs during pregnancy and lactation

During pregnancy and lactation, mammotrophs undergo hypertrophy and hyperplasia, causing the pituitary gland to increase in size. They show numerous RER & Golgi and granules increase in number and enlarge to triple its size (effect of estrogen)
Lysosomes increase after lactation

In hyperthyroidism, the follicular cells appear------------------ while the colloid content appear-------------

In hyperthyroidism, the follicular cells appear tall while the colloid content appear diminished because of increased thyroglobulin uptake to produce active thyroxin hormone

Quiz

Describe LM and EM of pinealocyte
Describe LM and EM of cells secreting cortisol

Thank you

A 72-year-old man complains of abdominal discomfort. Physical examination reveals neuromuscular weakness. Laboratory studies show markedly elevated levels of serum calcium and parathyroid hormone (PTH). This polypeptide hormone is synthesized and secreted by a cell characterized by which of the following?

a. Acidophilic cytoplasm with eccentric nucleus
b. Basophilic cytoplasm with vacuoles
c. Arranged in the form of follicles
d. Prominent smooth endoplasmic reticulum
e. Apical microvilli forming a brush border

Which of the following cells helps to organize clusters of endocrine glandular cells in the pars distalis of the anterior pituitary?

a) Fibrous astrocytes
b) Folliculostellate cells
c) Pituicytes
d) Reticuloepithelial cells
e) Satellite cells

T3 and T4 synthesis by follicular cells involves cellular actions which of the following cellular structures?

a) Smooth endoplasmic reticulum and microtubules
b) Microvilli and lateral interdigitations
c) Lysosomes and Golgi complex
d) Rough endoplasmic reticulum and thin filaments
e) Mitochondria and lipid droplets

A 24-year-old skydiver suffers “adrenaline rush” when jumping from airplanes. Which of the following cells is responsible for this condition?

f) Chromaffin cells
g) Follicular cells
h) Oxyhil cells
i) Ganglion cells

A 24-year-old skydiver suffers “adrenaline rush” when jumping from airplanes. Which of the following cells is responsible for this condition?

- **a) Chromaffin cells**
- b) Follicular cells
- c) Oxyhil cells
- d) Ganglion cells
- e) Chief cells

A newborn female was discovered to have virilization (development of male characteristics) of her genitalia. This case is most likely caused by increased production of hormones by cells characterized by which of the following?

a) Dense core secretory granules
b) Arranged in arched cords
c) More lipofuscin pigments
d) Cords of pale polyhedral cells
e) Arise from neural crest cells

Which of the following cellular communication occurs between cells in the islets of Langerhans?

a) Gap junction
b) Tight junction
c) Desmosomes
d) Fascia adherens
e) Zonula occludens